AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING

Civilian and Defense

JULY 15, 1951

In This Issue . . .

First Production Article on Ford-Mercury Automatic Transmission

Protective Measures for Renegotiation

Stretch Forming with Flexible Tooling

Paris International Aviation Show

Materials Handling at Large Tractor Plant

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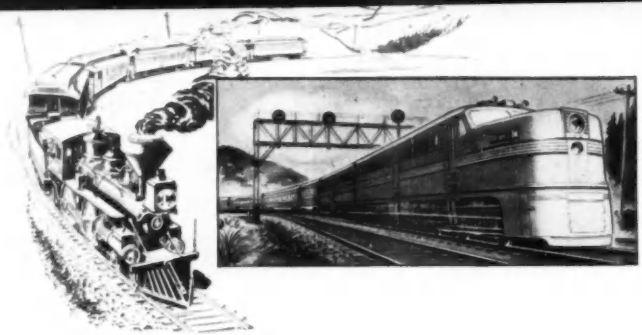
A CHILTON PUBLICATION



FASTER NOW—and BETTER, TOO

—because Heald machines have helped to set the pace for faster, better production of precision finished parts

Today's trend to faster and faster production has been accomplished with no sacrifice in quality. In fact—where Heald machines are concerned—speed and precision have gone hand in hand. With every new development for faster, more efficient production, there has been an equal or greater increase in accuracy and precision.

It didn't just happen that way. It is the result of Heald's philosophy—that the trend must be ever upward, in *quality* as well as *quantity*. That's why Heald Bore-Matics and grinders have consistently set the pace for faster, easier and better production. Remember—when it comes to precision finishing, it pays to come to Heald.

Diesel Locomotive Pistons Finished

FOUR TIMES FASTER

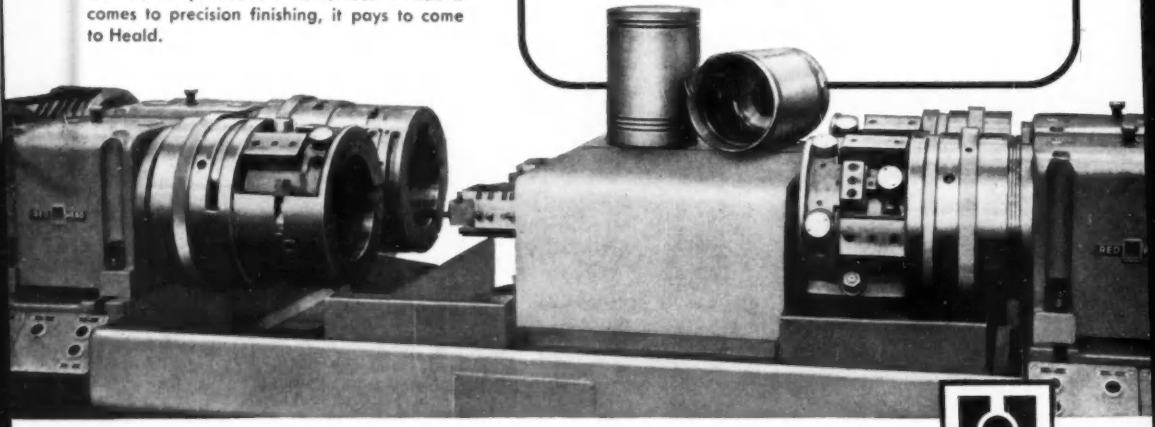
on a New Heald Model 522 Bore-Matic

In this case HERE'S WHY

1. **FIVE OPERATIONS COMBINED** on one machine—pistons are bored, chamfered, faced, grooved and relief-undercut in a single setup.

2. **FULLY AUTOMATIC CYCLE**—all five operations are performed automatically in sequence, on two parts at a time.

3. **SIMULTANEOUS LOADING AND BORIZING**—four-station setup enables two parts to be loaded while the other two are being borized. Handling time is not added to production time.



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KENWORTH

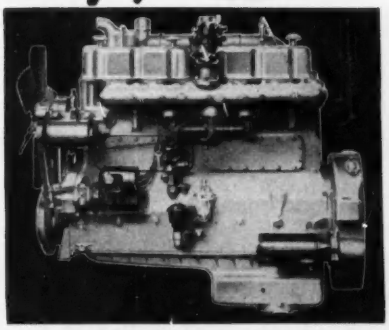
A FAST FIRE FIGHTER TRUCK

packed with pumping power

This truck has an engine that's a sure starter and a quick starter. It has to make a fast get-away, pick up speed and keep right on rolling—safely but swiftly. It goes to fires! And it has to put out power for those pumps when it gets there.

That's why there's a ***high output*** Waukesha 240 hp special power plant in this Kenworth Model 720 Fire Truck with a 750 gal. Class A Centrifugal pump, 500 gal. booster tank, and air brakes all around.

The Waukesha 145-GKB is a fire truck engine—from its twin ignition to the 3½-inch 7-bearing counter-balanced and hardened crankshaft. Its torsional vibration dampner, down draft carburetion; crankcase ventilation; overhead valves with Stellite-faced exhaust valves and seats; removable wet sleeve cylinders; arrangements for full electrical equipment, air brake compressor and all modern accessories give it the reliability Kenworth Motor Truck Corporation of Seattle, Washington, demand in all their trucks and buses. Get all the details. Send for Bulletin 1594.



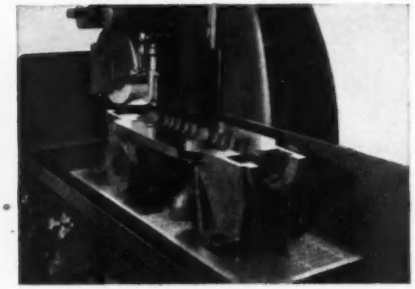
Waukesha 145-GKB High Output FIRE ENGINE SPECIAL
Six cylinders, 5¼-in. bore x 6-in. stroke. 779 cu. in. displacement
develops 240 hp. at 2400 rpm. 138

WAUKESHA ENGINES

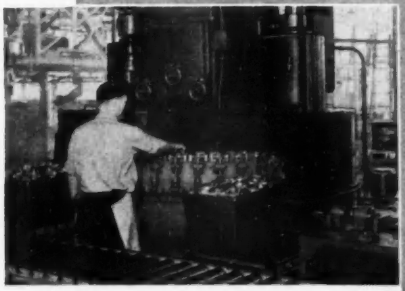
WAUKESHA MOTOR COMPANY • WAUKESHA, WISCONSIN

NEW YORK TULSA LOS ANGELES

WHERE THERE IS A FLAT SURFACE TO GRIND THERE'S A MATTISON TO GRIND IT.



40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder.



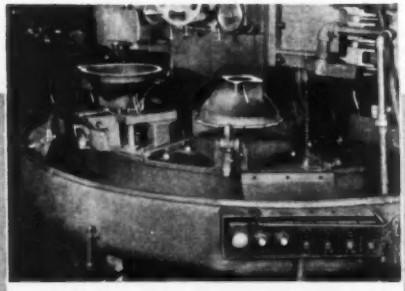
700 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder.

With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison is now in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced engineers are available to give you best production efficiency, finish and tolerances, with Mattison machines.

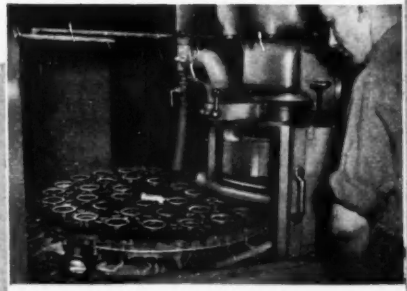
For any flat grinding ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalogs on any of the types shown or if you would like a copy of the general bulletin, let us know and we'll gladly send them to you.

Grinding Cast-Iron Cams — 5" diameter, 1⅛" thick — stock removal, each side .030". Production 190 surfaces per hour on Mattison (Hanchett Type) Rotary Surface Grinder.



200 Transmission Case surfaces ground per hour on Mattison (Hanchett Type) Rotary Automatic Grinder. A special 8-station mechanical fixture permits one operator to grind each end of this large 35 lb. casting, flat and parallel. Stock removal .050".



320 surfaces of cast iron compression heads per hour, removing 1/32" stock with Mattison No. 24 Rotary Surface Grinder.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

July 15, 1951 Vol. 105, No. 2

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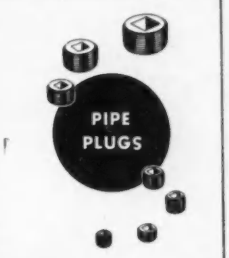

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TOUREK

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ESTABLISHED IN 1920

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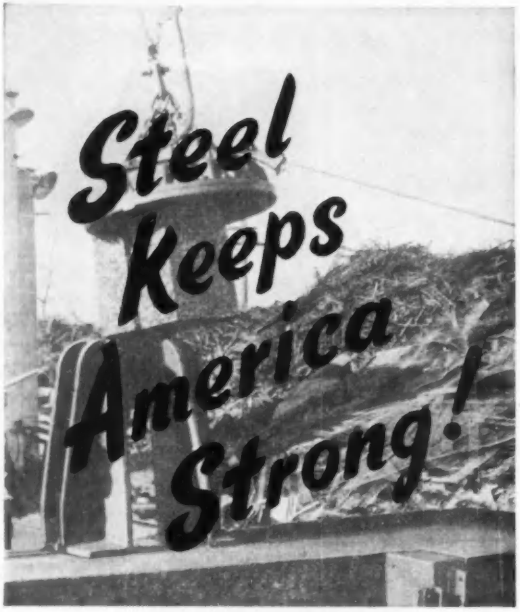

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If you are not baling your sheet metal scrap, perhaps you should be . . . not only for the immediate benefit to your own operation . . . but in the interest of a strong industrial economy. More and more steel is needed for its continued strength and growth.

If you question the advisability of baling your sheet metal scrap, competent counsel is available without cost or obligation. Galland-Henning engineers offer you the benefit of many years' experience in all types of scrap metal baling . . . and in the design, construction and installation of powerful, efficient baling equipment which assures lowest possible cost-per-ton.

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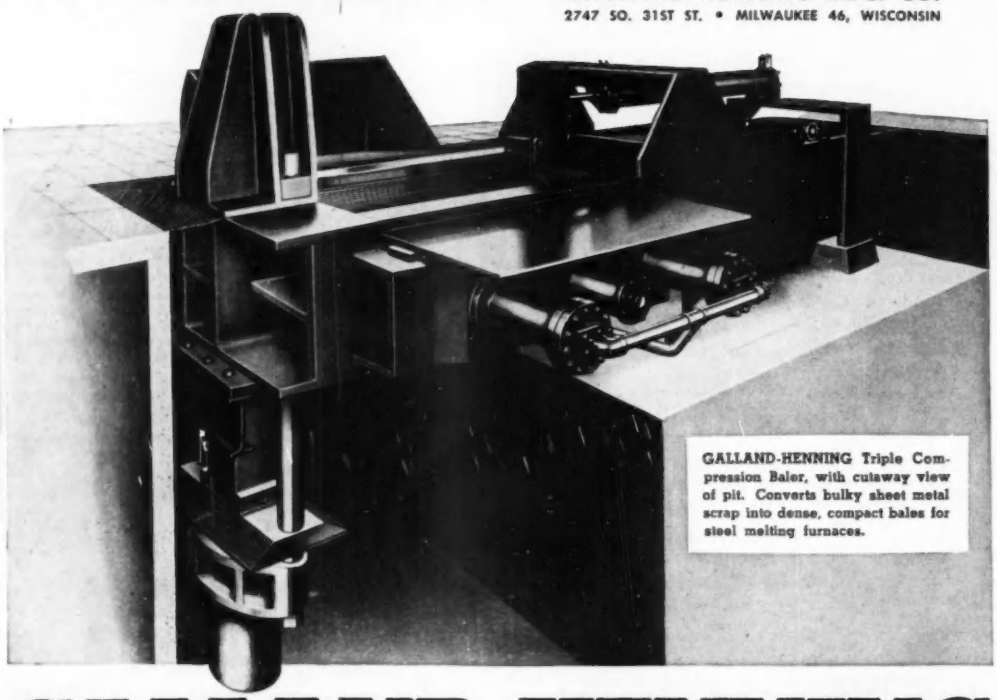

GALLAND-HENNING Triple Compression Baler, with cutaway view of pit. Converts bulky sheet metal scrap into dense, compact bales for steel melting furnaces.

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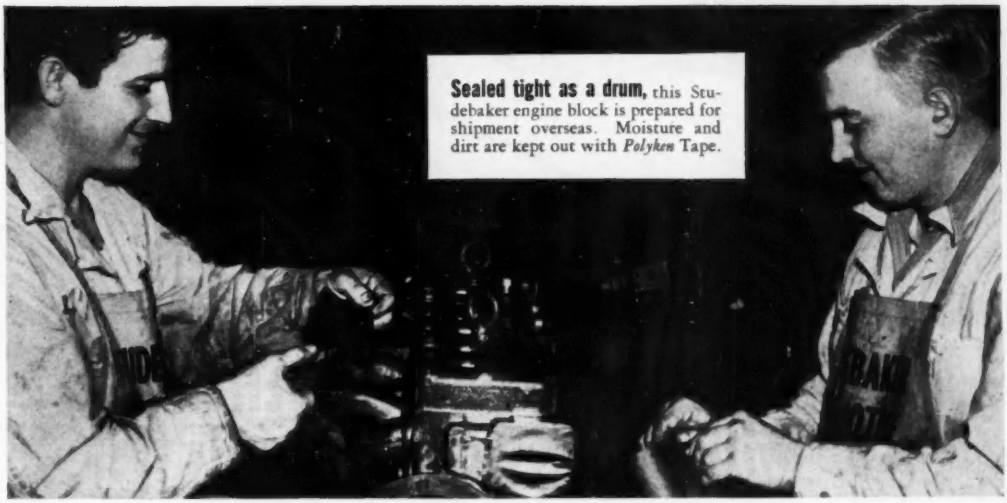

Sealed tight as a drum, this Studebaker engine block is prepared for shipment overseas. Moisture and dirt are kept out with *Polyken* Tape.

Two young "engine" chiefs from South Bend

Meet "Russ" Reinoehl and "Les" Lutes.

These handsome young men are preparing a new Studebaker engine block for export shipment.

Things being what they are, the blocks they put in shipshape condition haven't much chance of going on a luxury cruise. More likely they'll be put in the dark, dank hold of a big freighter, and not see the light of day until they get where they're going.

So, to be sure they get there clean and without internal rust that might make them useless, "Russ" and "Les" seal every large opening with *Polyken* Industrial Tape No. 214. This not only keeps the dirt out, but moisture, too.

Just for the record, the spark plug holes are sealed with wooden plugs. Then, when the miscellaneous parts are packed in corrugated containers, *Polyken* Tape No. 214 is again used to seal the containers.

The men in charge of the export shipping department say they have used *Polyken* Tape on this job for as long as they can remember.

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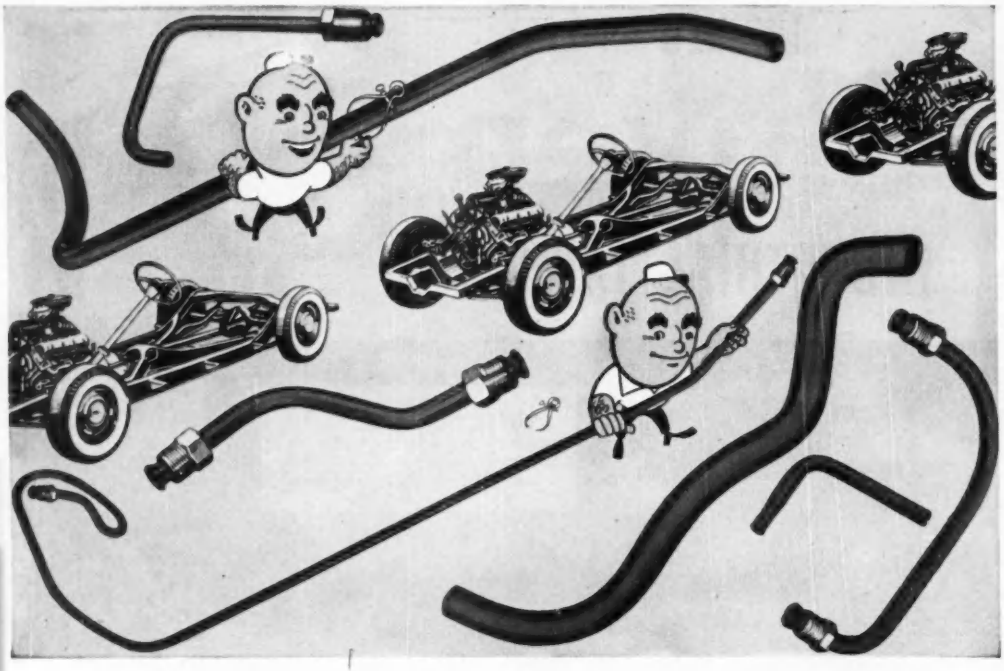

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BETTER for smoother *production*, for finer performance in your cars.

Your automotive tubing units, fabricated at Bundy, are formed exactly to specification, checked and double checked by our crews, then shipped direct, on time and *right*, to your assembly lines. If you prefer, Bundyweld® Tubing is available in straight lengths for smooth, fast fabrication in your plant.

Either way, Bundyweld helps reduce rejects, avoid production delays, lower costs for you. It's extra strong, yet ductile, too. It bends more readily and takes more bending with no danger of structural collapse or weakening.

And do those Bundyweld lines hold up! Leakproof, rugged double-walled Bundyweld takes jolts, jars, and stresses, for the life of your car, truck, or bus—in fuel lines, oil lines, hydraulic brake line systems.

Just double check Bundyweld's twenty-year reputation as the preferred tubing wherever motor-powered vehicles roll on wheels. Then, for the full story of amazing Bundyweld, write:

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DOUBLE-WALLED FROM A SINGLE STRIP

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Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Bonding metal fuses with basic metal, presto—

Bundyweld . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

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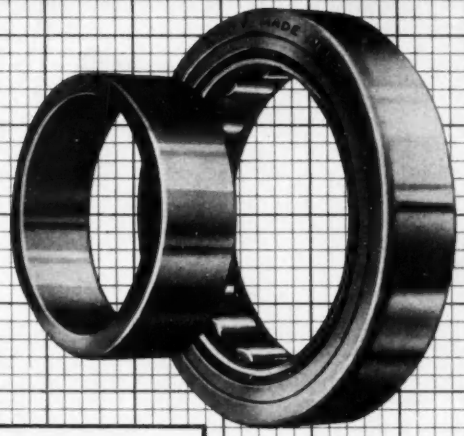

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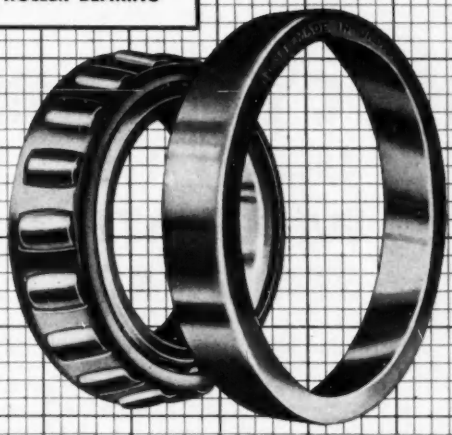
STRAIGHT CYLINDRICAL
ROLLER BEARING



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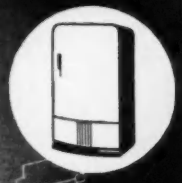

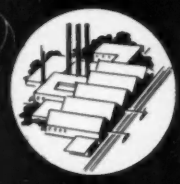

There is almost no limit to the number of ways Western Felts are serving today. Technical design and production specialists for decades have been in close cooperation with manufacturers of products employing felts for such purposes as absorbing vibration, retaining lubricants, excluding dust and grit, filtering gases and liquids, controlling temperatures and sound, firming and lining apparel, covering furniture, clothing people; for padding, packing, sealing, grinding, polishing, etc. It can be made waterproof and fungus-proof and flame resistant. It will pay you to place your felt requirements in the experienced hands of Western Felt. Its counsel and products will prove profitable. In whatever way you use it, Western Felt will add materially to improving your product. Insist upon WESTERN FELTS!

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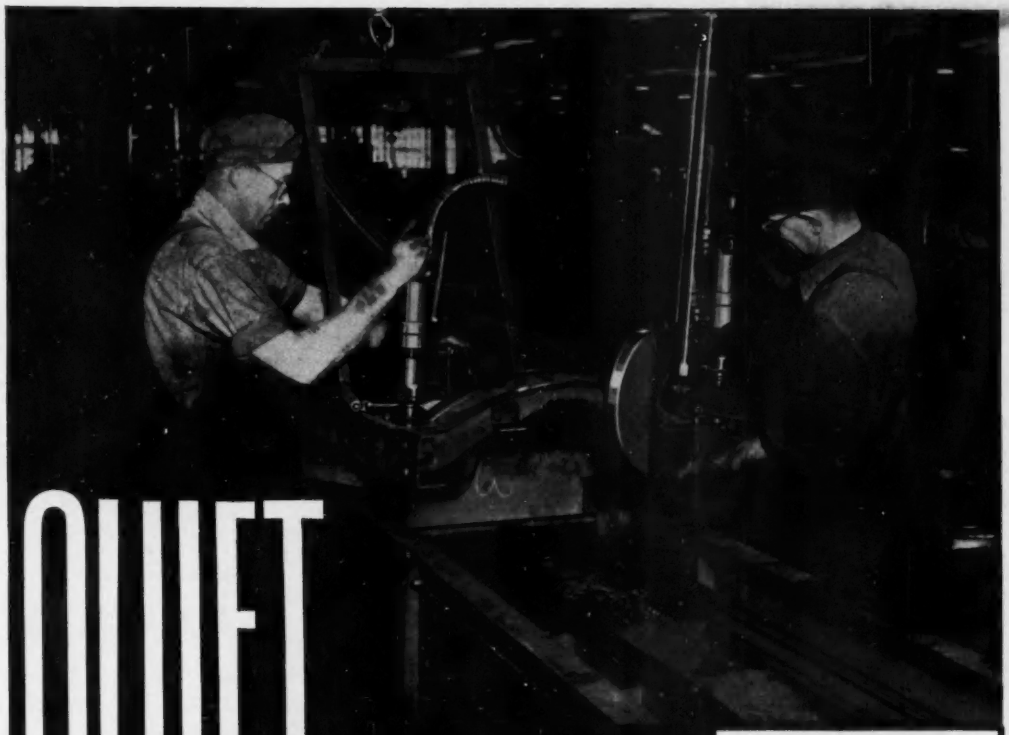
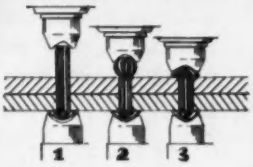


QUIET *riveters at work*

. . . not a sound as ⅜" rivets are cold formed in 2½ seconds . . . each the exact counterpart of its neighbor. The power source, a complete, self-contained, compact hydraulic pressure generator. The tool, unique and easily handled, is controlled by the touch of a button—fast, smooth, precise, automatic AND SILENT! Hannifin "Hy-Power" portable or stationary units are available in capacities from 5 tons to 100 tons (more in multiple) for riveting, punching, pressing, assembly or shearing.

Hannifin hydraulic and pneumatic machines can profitably serve you in many ways . . . consult our engineers on the possibilities. Hannifin Corporation, 1143 S. Kilbourn Ave., Chicago 24, Ill.

The quiet "Hy-Power" Hydraulic Work Cycle



Hydraulic pressure, under instant, reversible, finger-tip control, silently squeezes rivets in this manner:

1. Fast approach
2. Rivet squeezed
3. Ram returns

"Hy-Power" Hydraulics should be in your design file. Ask for Bulletin 150. Your copy will be supplied promptly.

do ALL you CAN do . . . with

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Field Engineers In All Leading Industrial Centers

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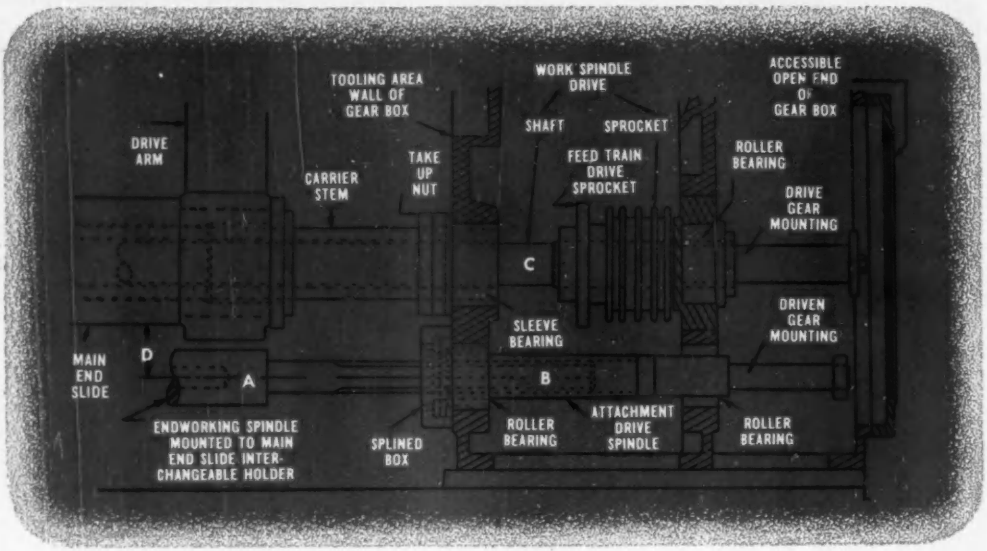


BEWARE OF THE BAR IN BARGAIN

With manufacturing costs much the same the country over, the purchase prices of various brands of a given type of machine tool should be about equal for equal value. Healthy competition tends to level out prices.

All of the best facilities of the highest priced machine may not be needed, and should not be expected of the lowest priced machine. The value of any brand depends on how well its facilities meet the particular needs of the individual plant.

Of all required facilities, those of low-cost operation and maintenance are universally considered important. A machine without them is a BAR to any GAIN at any PRICE.

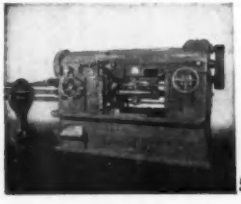
An example of **LOW-COST OPERATION AND MAINTENANCE FACILITY** is the **EXCLUSIVE** Conomatic **"ALL POSITION" END ATTACHMENT**, which has:

1. **Direct Drive to ANY Rotating Tool, in ANY or ALL SIX, Main End Slide Positions. Solid Tapping in ANY THREE Positions on ONE Set-up. Die Head Swing, D, clears COLLET CAPACITY in ANY Position.**

The above drawing shows Endworking Spindle, A, in a Main End Slide Position of a 1½" SIX SPINDLE Conomatic. Its splined shaft is rotated by the Attachment Drive Spindle, B. The drive from the Work Spindle Drive Shaft, C, is indicated. The Spindle, A, rotates in its bearing in an interchangeable Holder mounted to the Main End Slide, whose travel it may take. Three levers and cams offer independent travel to any three Endworking Spindles per single set-up.

2. **Accessible OPEN-END Application and INTERCHANGEABLE Attachment HOLDERS. Selective Speeds and Feeds.**

Six Attachment Drive Spindles may be applied to one set-up. Two are machine equipment. There is drive facility for 168 Speeds between 132 and 6158 RPM for drilling, boring, etc. Std. Drive Gears offer 10 Threading Speed Ratios.

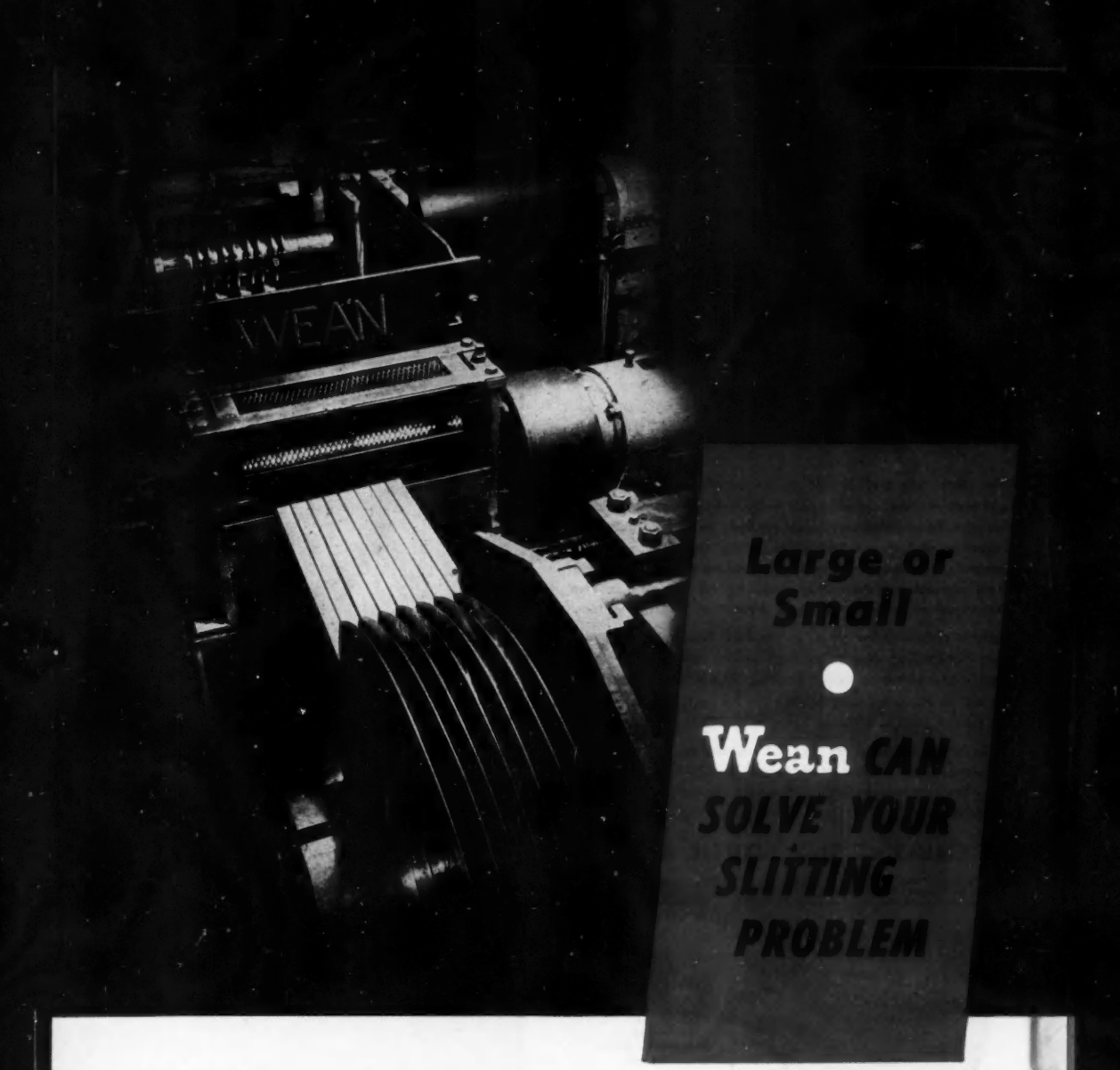


Buyer's Comparison Chart will guide you to full information

A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



Large or Small

Wean CAN SOLVE YOUR SLITTING PROBLEM

If you are in the business of handling strip steel or fabricating steel parts or products from strip steel you should give your slitting operation high consideration.

Well designed slitting lines enable you to reduce inventories, lower labor costs and eliminate expensive extras. Wean engineered slitting lines give you these important factors at lowest initial costs.

If you have a slitting problem—or merely desire a check on the efficiency of your present operation—call in Wean specialists.

Wean *Equipment Corporation*

CLEVELAND, OHIO

The Sign

OF SMOOTH, SURE STOPS!

THE INDUSTRY'S FINEST POWER BRAKING SYSTEMS

More than two and a half million installations have made Hydrovac the undisputed leader in the field of power braking. And now Bendix Products offers Air-Pak, an air-hydraulic unit similar in design and principle to the Hydrovac. Air-Pak changes air pressure into hydraulic pressure by means of two direct connected pistons, thus combining all the well proven advantages of hydraulic brake action with an air brake system.

Products of twenty-five years of practical braking experience, these outstanding power braking systems offer faster, more positive and better controlled braking. And in both the vacuum and the air actuated units, brakes can be applied instantly by foot power alone—a safety factor of tremendous importance.

Remember, regardless of size of vehicle or whether your preference is for vacuum or air brakes, for the industry's finest power braking systems be sure to specify Bendix* Hydrovac* or Bendix Air-Pak.

*REG. U. S. PAT. OFF.

BENDIX · PRODUCTS DIVISION · SOUTH BEND

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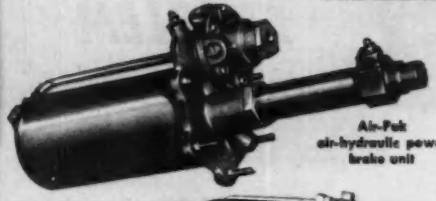
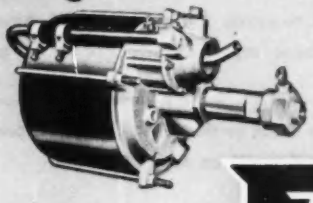
Bendix AVIATION CORPORATION



Air-Pak air-hydraulic power brake unit



Hydrovac vacuum-hydraulic power brake unit

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SAN FRANCISCO—R. J. Birch
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San Francisco 4, Calif.

LOS ANGELES—L. H. Jackson
3156 Willshire Blvd.
Los Angeles 5, Calif.

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Editorial and Business Executive Offices
Chestnut and 56th Sts., Philadelphia 39, Pa.
Cable Address Autoland, Philadelphia

High Spots of This Issue

How to Protect Yourself for Renegotiation

Under the Renegotiation Act of 1951 the funding of profits deemed to be excessive may prove a very real financial hardship to your company. Important it is to know what measures to take to insure intelligent determination of the profit margin to be retained. You will find authoritative help in this detailed lead article, page 32.

Equipment for Making Road Building Machines

Described and illustrated is the heavy equipment found in the Steel Fabrication Factory of Caterpillar Tractor Co. where are produced scrapers and rippers for huge road building operations. Page 34.

Stainless Steel Sheet Metal Forming Problems

The greatly increased use of stainless steel in jet engined aircraft as contrasted to that of reciprocating engined aircraft has imposed severe fabricating, manhour and tooling problems. This article is based on a report by North American Aviation, concerning stainless steel's advantages and disadvantages. Page 42.

Machining Ford-Mercury Automatic Transmissions

Starting on page 46 is the first of a series of production articles featuring the metal working and assembly operations on these new transmission developments. It deals with the Warner Gear Works in Muncie, Ind.

New Defense Facilities for Rapid Tax Write-Off

Certificates of Necessity in addition to those listed in the May 15 issue of AUTOMOTIVE INDUSTRIES are here published. They include the period between April 26 and June 22, showing that defense facilities to this date total 2132. See page 54.

23 New Product Items And Other High Spots, Such As:

Stretch forming with flexible equipment; a versatile materials handling setup at a large tractor plant; the Lancia Aurelia V-6 engine; latest jet engines displayed at the Paris Aviation Show; the Business Pulse; band tool slotting; and a new method for analysis of jet engine exhaust gas.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

CMP
and Ryerson Steel Service

As you know, the Controlled Materials Plan went into effect July 1. The full extent to which CMP will affect our own operations and those of our customers is difficult to predict. But as of July 1, we are required by law to give the following precedence to orders for steel from stock:

1. Orders backed by CMP directives. These emergency CMP allocations of steel by the National Production Authority get the highest priority, as they did under CMP during World War II. Since directives are primarily placed with steel producers, the warehouse tonnage involved may not be large, but the kinds and sizes are likely to be those most in demand.

2. Authorized Controlled Materials orders. These orders, authorized by Government Agencies or Industry Divisions under CMP, received second highest priority, and they will probably account for a larger proportion of warehouse steel. A typical authorized Controlled Material order might bear the allotment No. K2-3Q51 in which K stands for the Agency or Division making the allocation; 2 represents the specific program involved, and 3Q51 stands for the calendar quarter in which the authorization is valid. It should be noted that the symbol DO-K2, used in conjunction with the K2-3Q51 authorization, is extended only for the purchase of finished products, such as chain, wire rope, fastenings, etc., or for non-controlled materials such as plastic or babbitt, and is not used when ordering controlled material such as steel. Another important note: The NPA has just set up a blanket authorization to be used by manufacturers of certain products who require only small amounts of carbon or alloy steel for production purposes. The symbol employed is SU. For details see Direction No. 1 to CMP Regulation No. 1.

3. Orders bearing the old NPA DO ratings and calling for delivery before October 1, 1951. These orders bearing the DO symbol plus two digits such as DO-97 for Maintenance & Repair or DO-21 for Miscellaneous Defense requirements will remain valid during this change-over quarter, which ends October 1. Until then they have third highest priority.

4. Non-rated orders. With our tonnage considerably under last year and demand higher than ever, we may not be able to fill many of these non-rated orders—much as we would like to. For, of course, shipment depends on our having the steel in stock, no matter what the priority. But you can be sure that we will always do everything possible to help you get the steel you need.

★ ★ ★

IT IS IMPORTANT, therefore, that you give us the highest rating to which each order is entitled. And, in the case of oral or phone orders, be sure to send a written confirmation, including the rating which applies, within 15 days. As we are required to report all cases in which confirmation is not received, your cooperation on this point is important.

We appreciate the fact that many questions are bound to arise under the changing regulations prevailing today. So please remember that we are always glad to work closely with you on your steel procurement problems. Just call our nearest plant.

REQUIRED FOR CMP STEEL ALLOTMENTS. One of the following CMP Forms must be used by manufacturers filing with NPA for authorization of schedules and allotment of steel.

Form CMP-4A. For prime and sub-contractors of Class A products.

Form CMP-4B. For manufacturers of Class B products.

Form CMP-4C. For prime and sub-contractors engaged in construction work and for manufacturers of Class A products used in such construction.

In addition, you may find helpful information in CMP Reg. No. 4 which concerns the controls governing the steel warehouse industry. For copies contact the National Production Authority's regional or field office near you.

RYERSON STEEL

STEEL-SERVICE PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI • CLEVELAND PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

News of the AUTOMOTIVE INDUSTRIES

Vol. 105, No. 2 July 15, 1951

Slow Sales May Promote 1952 Automobile Show

Although most of the concern in the automobile industry at the moment is getting enough materials to build the number of cars permitted under NPA schedules, plans for a possible national automobile show late this year or early in 1952 are under consideration. There is some opinion in the industry that the cease-fire in Korea may result in easing the materials situation within the next few months to such an extent that selling automobiles may be as much or more of a problem than producing them. There is nothing definite in the way of show plans yet, but the industry is keeping a sharp eye on the situation so that it could move fast if necessary.

Buick Working on New Combustion Chamber

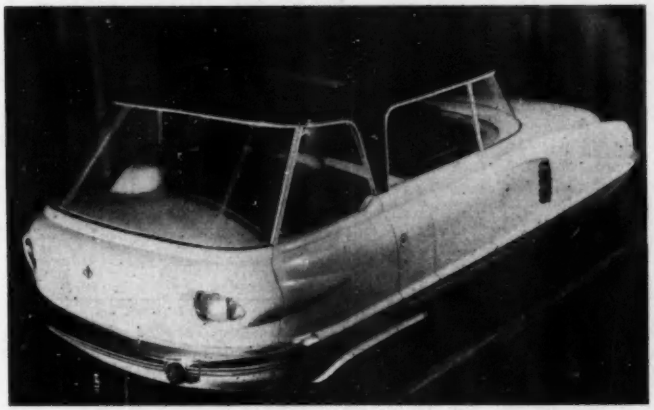
It now appears that a "battle of combustion chambers" is shaping up in the automobile industry. It was touched off by Chrysler when it introduced the hemispherical chamber in its new V-8 overhead valve engine. GM is known to have been working on something different, and it is reliably reported that when Buick introduces its new V-8 engine, possibly next year, it will carry a combustion chamber shape entirely new to the industry. Whether or not Buick can have the engine ready for the 1952 models is still touch and go, however, since it is having difficulty getting some of the large ma.hine tools it needs.

SAE '52 Summer Meeting to be Held in Atlantic City

The 1952 summer meeting of the Society of Automotive Engineers will be held in Atlantic City, N. J., from June 1st to 6th in the Ambassador and Ritz-Carlton Hotels.

GM May Help Build Machine Tools

While there is nothing official about it, it is reported that GM may take on building of machine tools for one of the large machine tool companies. It is understood that the work would be done at the Fisher Body Div. plant at Grand Rapids. GM's interest in the agreement would be to help increase production of machines, and would not be a permanent activity.



STYLED FOR 1961

Three British designers, E. Wilkes, H. Poole, and P. Ashmore, have attempted to anticipate what a passenger automobile of some ten years hence will be like in this five-foot scale model. A rear-engined gas turbine car, it has two pedals, accelerator and brake, and an electrically-operated reverse control. The gas turbine engine is placed over the rear axle and air inlets on the side of the body feed through two large filters to a common duct and thence to the centrifugal compressor.

Navy Skyrocket Plane Set New Speed and Altitude Marks

The Navy sonic research airplane, the Douglas Skyrocket, has attained the highest speed and altitude ever recorded by a piloted airplane, the Navy has announced. The unofficial estimated speed was just under 1300 mph, and the ceiling almost 70,000 ft. Security regulations preclude announcement of actual speeds and altitudes reached during recent research flights, but they are unprecedented, the Navy stated. Accomplished under rocket power after being carried aloft by a B-29 mother ship, the Skyrocket's history-making tests were flown at Edwards Air Force Base, Muroc, Calif.

Automobile Industry Plans Big Advertising Campaign

Plans are under way quietly for a large scale institutional advertising campaign for the automobile industry. It would consist of a long-range, high-level national advertising program to augment the public relations program carried on by the Automobile Manufacturers Association. It would deal with the industry's significant role in the national economy, and how it contributes to prosperity and a high standard of living through the most modern mass production methods, engineering, research, use of small business suppliers, and similar aspects. It is expected that details will be completed by August or September.

Lockheed Wins USAF Competition for Turpo-Prop Transport

U. S. Air Force competition for design of a medium transport plane powered by a turbo-propeller has been won by Lockheed Aircraft Corp., Burbank,

1951 MOTOR VEHICLE FACTORY SALES FROM U. S. PLANTS*

	Passenger Cars	Trucks	Buses	Total Vehicles 1951	Total Vehicles 1950
January	479,589	127,563	681	606,833	581,362
February	505,863	111,935	521	618,321	475,465
March	617,399	138,794	829	755,022	580,662
Total—Three Months	1,601,853	378,312	2,011	1,980,176	1,637,489
April	503,038	135,415	819	639,272	560,311
May	512,075	140,050	742	652,868	696,893
Total—Five Months	2,616,967	651,777	3,572	3,272,316	2,893,693

1951 DOMESTIC TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	50,435	21,029	6,476	16,957	5,529	5,057	3,180	109,262
February	43,207	16,940	6,639	14,787	4,676	5,320	3,265	94,834
March	52,948	25,003	9,457	17,987	3,718	5,786	3,386	118,236
Total—3 Mos.	146,590	62,972	22,602	49,719	13,927	16,773	9,902	322,385
April	51,290	21,638	11,179	18,805	5,165	6,304	3,302	117,483
May	52,991	22,062	11,389	19,837	5,052	6,652	3,461	121,484
Total—5 Mos. 1951	230,871	106,692	45,170	88,153	24,140	29,719	16,533	561,279
Total—5 Mos. 1950	225,899	98,283	33,388	69,137	16,879	14,367	9,773	467,416

*—Automobile Manufacturers Association.

Calif. The aircraft has been selected for further development, rather than immediate adoption for standard use. It is planned that four Allison T-38 turbo-prop engines will propel the initial model.

One feature of the Lockheed design is a cargo floor only 45 in. above ground, or airstrip, level. Large aft cargo doors permit loading of bulky items without use of elaborate freight-handling equipment. Lockheed was one of five aircraft companies submitting designs of new medium transports to be used for aerial re-supply and evacuation of casualties in forward areas.

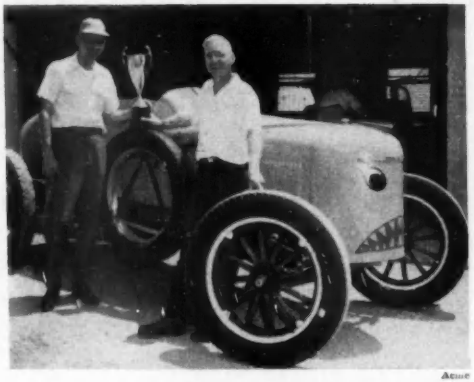
Army Develops New Lubricant

Developed by the Army Ordnance Corps, a new grease that is said to perform equally as well in tropic heat or Arctic cold has been adopted for use on all Army vehicles and artillery pieces. The Army said that the all-temperature lubricant is expected to simplify the Army's supply problem by replacing at least six different greases.

Urge Military Orders for Automotive Parts

Industry is urging the NPA to provide for military orders for automotive replacement parts to carry with them allotments of controlled materials sufficient to fill those contracts. Unless this is done, the industry's advisory committee predicts, a serious shortage may rapidly develop. The current trouble is that in making application for allotments, the industry did not figure on a flood of orders from the military for "de-mothballing" and repairing large numbers of vehicles, including tanks.

Some of these orders, industry says, have thrown planned metal needs out of balance by reason of the type of order. For example, an increase in orders for tank pistons (four times heavier per unit than for cars) causes estimated metal needs for piston-making to fall short of actual requirements. NPA advises parts manufacturers to file interim applications for larger allotments while the agency makes whatever immediate adjustments are possible.



Acme

ECONOMICAL!

Dave Berry (left) and Fred Schuette exhibit the cup they won in the Shell Oil Co.'s mileage marathon at Wood River, Ill., with their 1924 car, which achieved a gasoline economy of 98.6 mpg.

K-F Gets $25 Million Credit for War Work

The completion of a $25 million credit from a group of nationally known banks, to be used for the performance of defense production contracts has been disclosed by the Kaiser-Frazer Corp. Headed by Bank of America, the other banks in the group are Mellon National Bank and Trust Co., Pittsburgh, and Bankers Trust Company, New York. Defense contracts to be initially financed under the $25 million revolving credit will be performed by K-F wholly-owned subsidiary, Kaiser Manufacturing Corp., and include Fairchild C-119 cargo transport planes; Wright R-1300-1 aircraft engine; and component parts of the Lockheed P2V patrol bomber now being built by Kaiser Manufacturing, Oakland Aircraft Div., Oakland, Calif.

North American Gets Contract for Navy Fury Jets

A production contract for an undisclosed number of FJ-2 Fury sweptwing jet fighters was awarded to North American Aviation, Inc. The planes will be produced in the Naval Industrial Reserve plant at Columbus, O., which is now being operated by North American Aviation under an agreement with the Navy. North American has also licensed the Commonwealth of Australia to manufacture the F-86E Sabre jet fighter.

Packard Reveals Details of New Jet Engine

Packard has revealed additional details about the J-47-GE-23 jet engine it will build as a prime contractor for the U. S. Air Force. The engine is rated at more than 5800 lb thrust, approximately 600 lb more than previously reported. It will be used in the Boeing B-47 Stratojet bomber. Features of the engine include a special ignition system

for high altitude starting and "hot nose" deicing by use of hot air forced from the compressor into hollow parts of the nose. The engine may be equipped with water injection to increase thrust. Packard has already started construction of a 700,000 sq ft plant at Utica, Mich., where the engine will be produced.

GM's Harrison Radiator Gets Jet Part Contract

The receipt of a contract to manufacture a major component of the Sapphire-turbojet engine being produced for the Air Force was announced by GM's Harrison Radiator Div.

"For security reasons, the value of the contract and the quantities involved cannot be disclosed," Douglas B. Whitney, general manager, declared. "It is estimated, however, that between 600 and 700 of the present Harrison working force eventually will be employed in the production of these parts." Mr. Whitney added that outside suppliers will be called upon to furnish parts and production materials as well as tools and machine equipment. The division already has received several contracts for Navy equipment.

K-F to Equip Dowagiac Plant for Aircraft Production

The Kaiser-Frazer Engine Div.'s Dowagiac, Mich., plant will be tooled for production of components for Wright R-1300 aircraft engines to be built for the Air Force at the Detroit engine plant. The Dowagiac facility will be equipped to perform about 47 per cent of the machining operations required on the Air Force project. Production of the 800-hp radial engines, now used in the North American T-28 advanced trainer, is scheduled to start at the Detroit plant in January.

Break Ground for Giant Press Forging Plant

Ground was broken recently for the construction of a new multi-million dollar press-forging plant at North Grafton, Mass., for the Wyman-Gordon Co. The huge plant will be an important unit in the expanding defense program of the U. S. Air Force. Forged parts for military aircraft will be made there by Wyman-Gordon.

Bendix Radio Subcontracts Now Over $33 Million

The Bendix Radio Div., Bendix Aviation Corp., has over $33 million of defense work subcontracted over a 10-month period. The division's subcontracts include over $12 million in production assigned to firms having 500 employes or less.

Ryan to Make Rocket Motors for Douglas

The Ryan Aeronautical Co., San Diego, Calif., has received a contract from the Douglas Aircraft Co. to produce a small number of complete rocket motors for a surface-to-surface missile under development. The missile is a project of the Army Ordnance Corps and its development is under the direction of the Jet Propulsion Laboratory of Caltech.

Fairchild Gets New Plant in Chicago

The U. S. Air Force has turned over a huge government-owned building in Chicago, Ill., to the Fairchild Aircraft Div. A facilities contract for about $20 million is expected to be signed in the near future. Fairchild will build the medium transport C-119 Flying Boxcar for the Air Force at this plant.

Caterpillar Tractor Gets $22 Million Order

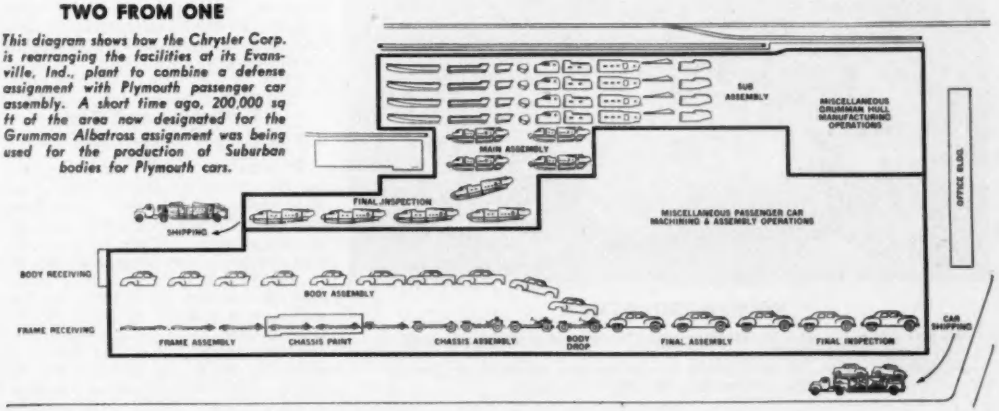
Caterpillar Tractor Co. has been given a $22 million defense order for three of its larger models of track type tractors, bringing to more than $72 million the total of all military contracts held by the company. In addition to the latest order, options for additional machines and parts are included, which could bring the total order to approximately $32 million. The tractors will be used by the Army, Navy, and Air Force.

Northrop Plans 30 Per Cent Expansion

Plans for a 30 per cent expansion of Northrop Aircraft Inc.'s manufacturing facilities has been announced jointly by the U. S. Air Force and Northrop. Keyed to increased production requirements, the expansion program will provide for construction and equipping of approximately 450,000 sq ft of additional manufacturing area. About $5.3 million will be expended jointly for buildings, machine tools and equipment under the program. Northrop also plans to establish a branch factory on a 33-acre site at Anaheim, Calif., for the

TWO FROM ONE

This diagram shows how the Chrysler Corp. is rearranging the facilities at its Evansville, Ind., plant to combine a defense assignment with Plymouth passenger car assembly. A short time ago, 200,000 sq ft of the area now designated for the Grumman Albatross assignment was being used for the production of Suburban bodies for Plymouth cars.



production of optical range finders for the U. S. Ordnance Corps. The range finders are to be used in tanks.

Award Anti-Aircraft Unit Contract to AC Spark

The Ordnance Corps has placed an initial order with GM's AC Spark Plug Div. for fire control systems, a major component of the Skysweeper anti-aircraft gun. An electronically-controlled instrument, the fire control system automatically directs the gun by radar so that the projectile will meet the moving target and destroy it.

Douglas Gets Contracts for Guided Missiles

The Douglas Aircraft Co. has received production orders for two types of guided missiles, one for the Navy and one for the Army Ordnance Corps, according to Donald W. Douglas, president. As major subcontractor on the two projects, Douglas had both missile projects under development for the past five years. The Army Ordnance Corps missile is a supersonic ground-to-air type.

Big British Helicopter in Production

A new 12-place British helicopter, the S.55, with a range of over 400 miles, has made its first flight and is in quantity production in the Westland Aircraft Works at Yeovil, Somerset, England. The S.55 is an American design built under license in Britain.

DESIGNED FOR ROADS

Designed to meet the needs of small community road districts, large farms and ranches and contractors for economical grading and leveling operations, the new Dearborn Road Maintainer is powered by a Ford tractor. The Maintainer has a hydraulically-controlled eight-foot blade. Additional equipment available includes a berm leveler, and side mower.

Chrysler to Build Plant for Jet Engine Job

Chrysler has announced that it will build a 1.6 million sq ft manufacturing and testing plant just north of Detroit for production of Pratt and Whitney J48 jet engines. The Navy will acquire the land required, and the plant will be government owned. Chrysler's initial contract totals $91 million for facilities. The plant will be constructed on a 306-acre tract between Detroit and Mt. Clemens, Mich.

NOW IN PRODUCTION

This 1951 Oldsmobile super 88 deluxe convertible coupe is now in production. Operated hydraulically, the top can be raised or lowered in a few seconds. Hydra-Matic Drive and hydraulic window lifts are available as optional extra equipment, and the convertible is powered by the Rocket V-8 engine.

AiResearch Jet Starter Completes Tests

A 140-hp air turbine starter, powerful enough to start turbojet and turboprop engines in the 10,000-lb thrust and the 8000-hp class within 10 to 30 seconds, has successfully completed final cycling tests required by the Air Force, according to AiResearch Manufacturing Co. Claimed to be the most powerful air starter ever developed, the unit weighs 32 lb.

Kaman Gets Navy Contract for Jet Helicopter Test

The Navy has awarded the Kaman Aircraft Corp., Windsor Locks, Conn., a contract to investigate the use of gas turbines in helicopters. Kaman plans to use a Boeing 502-2 gas turbine in connection with helicopter performance research. This proposal was selected recently by the Navy Bureau of Aeronautics as the best of several submitted by helicopter manufacturers.

Korea Increases Car Output Uncertainty

The confusion and uncertainty facing the automobile industry during the third and fourth quarters of this year has been further heightened by the Korean situation. While it is certain that materials have become tighter in recent weeks giving rise to some doubt that the industry could build the 1.2 million cars allowed by NPA in the third quarter, there is some belief that materials might possibly be freed up after the end to the shooting war in Korea. Much will depend on the atti-

tude of Congress and how successful the administration is in selling its program of pushing war production at an accelerated rate.

The automobile industry is solidly behind the defense effort and supports any necessary diversion of materials for war goods, but also takes the position that if steel and other critical materials are allocated for defense work only as fast as they can be consumed, there will be plenty of steel for automotive and other civilian production. At the moment the situation is completely confused, with no one knowing whether there will be any freeing up of materials because of the Korean truce or whether the defense program will go on at a heavy rate together with allocations of materials at a rate greater than war goods can absorb them.

AC Spark Plug Div. To Expand Plant

GM's AC Spark Plug Div. has announced a plant expansion program that will increase manufacturing space at Flint by 50 per cent. Work will get under way soon on a new building which will have 590,000 ft of floor space, and which will be used for defense production.

Ford Takes Up Big Land Option in Canada

A multi-million-dollar industrial project that may make Oakville, Ont., Canada, into the third "automobile city" of Canada was envisaged with the announcement that the Ford Motor Co. of Canada Ltd., has taken up options on 427 acres of land in Trafalgar township. While Ford officials said that it is not expected that a plant will be erected immediately the land has been purchased, it is believed that if a threat of war continues to develop, Oakville would become a key town in defense production. Announcement of the pending purchase was made by Rhys M. Sale, president, Ford of Canada.

Form New Advertising Agency The Allman Co., Inc.

A new advertising agency, the Allman Co., Inc., with L. C. Allman, former executive vice-president of The Fruehauf Trailer Co., as president, has been formed in Detroit, Mich. The basic account of the agency will be Fruehauf, and the new firm will also service several other related accounts, including the Trucking Industry National Defense Committee. For Fruehauf, its functions will include all phases of advertising, sales promotion and sales training. Mr. Allman, a Fruehauf vice-president since 1939, has resigned his Fruehalf position, but will continue as a stockholder and director of the concern. Norman Rowe, Fruehauf director of advertising for 15 years, will be vice-president of the Allman agency.

K-F Explores Car Sales Through Chain Store

Kaiser-Frazer has held discussions with a large retail chain to explore the possibility of a test program for sale of the company's Henry J cars through the chain's retail stores. There is nothing definite in the way of such a program yet, however. The problem is a particularly delicate one between K-F and its dealers, and it is understood that if and when such a program is tried it would be in areas where K-F either has no dealers or perhaps a weak dealership. It is also understood that the chain in question is Sears Roebuck and Co.

Fram Opens New Plant in Ohio

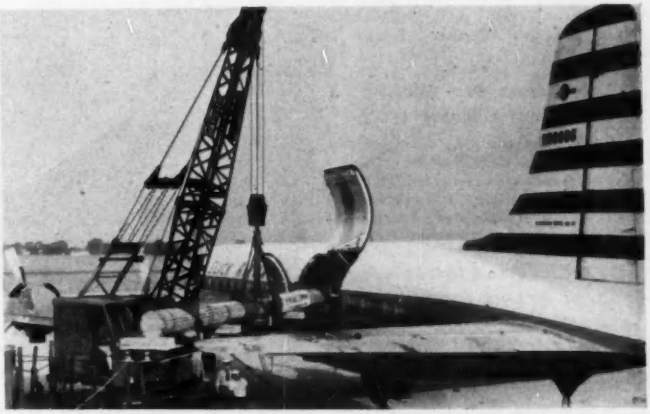
The Fram Corp., Providence, R. I., has opened its new oil filter and replacement cartridge plant in Greenville, O. This new plant is described as the first in the world to be designed and constructed for the express purpose of manufacturing oil filters and cartridges.

Weber Showcase Buys Airquipment Co.

The Airquipment Co., a subsidiary of Lockheed Aircraft Corp., was purchased for $1.3 million by Weber Showcase & Fixture Co., Inc., Los Angeles. Not included in the purchase was Aerol Co., Inc., a subsidiary of Airquipment, which becomes a direct subsidiary of Lockheed Aircraft Corp. The plant adds 200,000 sq ft of floor space and equipment to Weber's aircraft facilities, giving the concern a combined capacity of $15 million a year production, according to Karl Weber, chairman of the board of Weber Aircraft Corp. Airquipment will continue to manufacture ramps, jacks, trucks, ladders, slings, cranes, and other airplane servicing items. E. K. Meredith is president of the new company; W. S. Pallette, secretary; and Fred Weber, director.

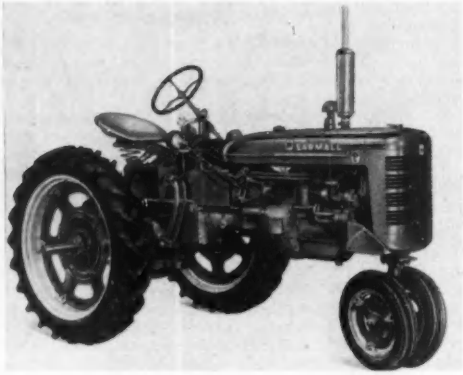
Spare Tire Ban Off in July

Sometime during July automobile manufacturers will again be permitted to equip new vehicles with spare tires. Early this month, the NPA was preparing to revoke the ban "as soon as the order could be prepared." NPA Director Fleischmann said that since the rubber crisis had "eased," and with unit production restricted, restoration of the fifth tire would have little effect on the total rubber supplies.



TIE ROD BY AIR

Described as the heaviest single piece of machinery ever transported by a commercial airline, this 10-ton tie rod was flown from Philadelphia by the Slick Airways for the Aluminum Co. of America to the company's Vernon Works at Los Angeles, Calif. The tie rod will be installed on an extrusion press.



NEW FARMALL SUPER C

The new McCormick Farmall Super C tractor, introduced by the International Harvester Co., has an improved engine design which provides more power, and all-weather engine temperature is maintained through a bigger-capacity, pressurized cooling system. This new model tractor features self-energizing disk brakes.

Quaker Rubber Expanding Facilities

The Quaker Rubber Corp., Div. of H. K. Porter Co., Inc., has begun a quarter million dollar expansion of its hose manufacturing facilities to produce high pressure wire braided hose for the U. S. Air Force.

Titeflex Now Subsidiary of Atlas Corp.

The Markley Corp. has acquired the business of Titeflex, Inc., of Newark, N. J., and Markley has amended its name to Titeflex, Inc. This now means that Titeflex, Inc., is a subsidiary of the Atlas Corp. of New York inasmuch as Atlas controlled Markley. The Titeflex management remains the same as before.

Sugarman Buys Diesel Engine Maker

J. J. Sugarman Co., Los Angeles, purchased the Venn-Severin Machine Co., Chicago, manufacturers of Diesel engines. Willis Hirsch, a partner in the Sugarman firm, becomes president of the newly-acquired company.

CAA Completes '51 Revision of Airport Forecast

The Civil Aeronautics Administration has completed its 1951 revision of the annual three-year forecast of airport construction and improvement needs to meet foreseeable demands. The current version lists 4945 sites, which include construction of three new express airports, 12 new truck airports, 75 new feeder type, 350 new secondary, and 1524 new personal type airports. The estimated cost of the program is placed at $662 million, split almost equally by federal aid and local matching funds. No funds are assured, however, and contingent upon congressional appropriations, the CAA includes in its coming fiscal year program those locations showing greatest need.

Nominate R. J. S. Pigott for 1952 ASME President

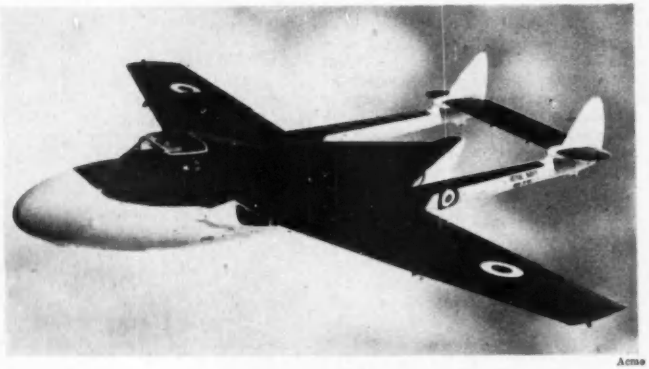
Reginald J. S. Pigott, director of the engineering division of Gulf Research & Development Co., Pittsburgh, a subsidiary of the Gulf Oil Corp., has been nominated as 1952 president of the American Society of Mechanical Engineers. Mr. Pigott heads a slate of new ASME nominees, including four regional vice-presidents and two directors-at-large, submitted by the society's nominating committee. Since only one name is presented for each office, nomination is tantamount to election.

Ford Buys Land for Aircraft Accessories Building

Ford Motor Co.'s Parts and Equipment Manufacturing Div., has bought 3½ acres of land adjacent to its headquarters plant in Ypsilanti as a site for the erection of an aircraft accessories building. The new structure will consist of a two-story administration building and a manufacturing section combining both one and two story features. The new buildings will have about 400,000 sq ft of floor space.

Radioactive Material Used for Tire Tests

B. F. Goodrich is using radioactive materials to accelerate wear tests of tire treads. The company is using radioactive phosphorous and mixing it into the compound for the top layer of tread material for the special test tires. A portable Geiger counter mounted on a small cart scans the track made by the tire to measure accurately the amount and size of particles thrown off during wear. X-ray photographs also are used to measure the wear left in the tracks of the "hot tires." In addition, a sheet metal air scoop behind the tire and above the road catches



Acme

FAST CLIMBING VENOM

This is reportedly one of the first photographs to be released of the British Royal Navy's new jet fighter, the Sea Venom. Powered by a jet engine of 5000 lb static thrust, the plane is noted for its fast rate of climb and combat maneuverability

rubber blown into the air, which later is measured in the laboratory.

Name Chayne Chairman of AMA Group

Charles A. Chayne, GM vice-president in charge of the engineering staff, has been elected chairman of the Engineering Advisory Committee of the Automobile Manufacturers Association. An engineer for over 25 years in the automobile industry, Mr. Chayne succeeds J. M. Crawford who had served as committee chairman for the past two years, and who recently announced his retirement from GM.

GE Method of Joining Silicone Rubber to Steel

General Electric Co. chemists have discovered a method of joining silicone rubber to steel and other surfaces in a permanent bond said to be stronger than the rubber itself. Key to the process is a thin, glue-like primer, which forms a strong bond between silicone rubber and many surfaces beside steel, including glass, ceramics, aluminum, tin, and copper, according to research chemists of GE's Chemical Dept.

Industry Expects OPS O.K. On Car Price Rises

There is considerable optimism among passenger car companies that price increases will be allowed soon by OPS. Car makers have excellent data to justify higher prices on the basis of greatly increased cost of materials, higher wages, and greater unit costs because of lower volume imposed by controls on materials.

Award '51 Harmon Trophy to Col. David Schilling

The 1951 Harmon International Aviation Trophy for the world's outstanding aviator of 1950 has been awarded to Col. David C. Schilling of the U. S. Air Force. Col. Schilling, at present on temporary duty in England as commanding officer of the 31st Fighter Escort Wing at Manston, England, received the aviator's trophy specifically for accomplishing the first non-stop jet flight between Great Britain and the United States.

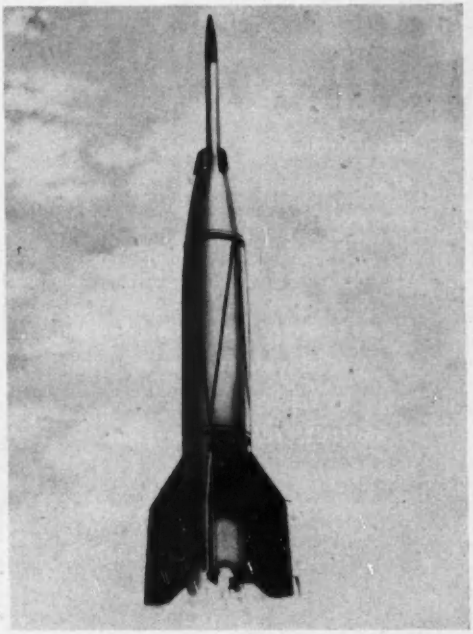
ASTM '51 Meeting in Atlantic City

The 1951 annual meeting of the American Society for Testing Materials, held June 18 to 22 at Atlantic City, featured 23 technical sessions and included 615 meetings of the technical committees. The registered attendance, 2277, exceeded the figure for 1950 by about 150. Sixty-two of the society's technical committees reported at the meeting, with the result that 57 new specifications and tests were approved and revisions in over 200 existing tentatives and standards were acted on. About 75 specifications and tests that have been published previously as tentative were approved for reference to Society letter ballot for adoption as standard.

The meetings of main technical committees and their subcommittees, totaling 615, were in progress from June 17 through 22. At times there were as many as 50 meetings running simultaneously. It was estimated that at the 1950 meeting there were about 500 meetings of committees. Of the 23 formal technical sessions at the ASTM annual meeting where the papers and reports and discussions were presented, 11 were devoted to seven symposiums. These covered bulk sampling, consolidation testing of soils, flame photometry, surface and subsurface reconnaissance, measurement of consumer wants, structural sandwich construction and acoustical materials.

Truman S. Fuller, engineer in charge of works laboratory, General Electric Co., Schenectady, N. Y., was elected president for 1951-1952, succeeding L. J. Markwardt, assistant director, U. S. Forest Products Laboratory, Madison, Wisc., who continues on the board of directors as past-president for three years. L. C. Beard, Jr., assistant director of Socony-Vacuum Laboratories, Socony-Vacuum Oil Co., Inc., New York, N. Y., is the new vice-president. New members of the board of directors are as follows: J. W. Bolton, director of metallurgical research and testing, the Lunkenheimer Co., Cincinnati, O.; R. A. Schatzel, vice-president and director of engineering, Rome Cable Corp., Rome, N. Y.; E. O. Slater, president and manager, Smith-Emery Co., Los Angeles, Calif.; Stanton Walker, director of engineering, National Sand and Gravel Assn., Washington, D. C.; and F. P. Zimmerli, chief engineer, Barnes-Gibson-Raymond, Div. of Associated Spring Corp., Detroit, Mich.

BUMPER TAKES OFF



This is a two-stage Bumper rocket which is shown taking off at the White Sands, N. M., proving grounds. It leaves its launching platform at approximately a 10 deg angle to counteract rotation of the earth. The thin, pencil-like nose is the Wac Corporal which is released after the missile is about 20 miles high. It continues on its own power and has attained a record 250-mile-altitude. The Bumper program is carried on by the General Electric Co. for the Army Ordnance Dept.

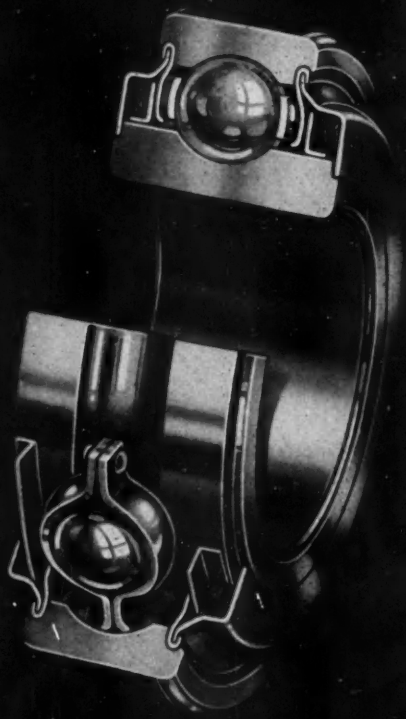
Republic Rubber Plans Expansion

The Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, O., is planning the immediate construction of a new large plant addition.

Built to be forgotten!

The lubricated-for-life
rear wheel ball bearing—
originated and developed
by New Departure—
has established a record
of unsurpassed dependability
and freedom from servicing.

New Departure Rear Wheel Bearings
never need lubricating or adjustment
either by car builder or owner.
Completely sealed against dirt
and protected from wear
they are truly, *Built to be Forgotten!*



Nothing Rolls Like a Ball...

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

143

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

The Electric Auto-Lite Co. — Byron A. Fay, a director and vice president in charge of manufacturing, has been named vice chairman of the board.

The Electric Auto-Lite Co.—H. E. Hasemeyer, vice-president, was named executive vice-president.

The Electric Auto-Lite Co.—J. H. Lambrix was elected vice-president and director of purchases.

General Motors Corp.—The board of directors elected **Gen. Lucius D. Clay** a member of the board.

Ethyl Corp.—**B. Bynum Turner** has been elected a vice president.

Borg-Warner Corp.—The election of **W. B. Caldwell** as president of the company's Calumet Steel Div., in Chicago Heights, Ill. and Franklin Steel Div., in Franklin, Pa., has been announced.

Chrysler Corp., Marine and Industrial Engine Div.—**Charles H. Morris** has been appointed chief engineer.

The Timken Roller Bearing Co.—**R. A. Schimpf** has been named chief works engineer; **C. M. Maratta** chief consulting engineer; **L. A. Holder**, chief mechanical engineer; and **H. J. Urbach**, executive engineer.

Fram Corp.—**Howard E. Robinson** has been elected vice president in charge of sales. **Milton M. Somers**, sales manager of the Automotive Jobber Div., has been promoted to general sales manager. **Arthur F. Pettet** has been elected vice president and general manager.

General Motors Corp., New Departure Div.—The following promotions have been announced: **Seth H. Stoner**, general works manager; **Frederick J. Garbarino**, chief engineer; **Alfred F. Herold**, general manufacturing manager; **John J. Curry**, assistant to general works manager on special assignments related to defense effort; **George A. Smith**, manager of production engineering; **Robert T. Collins**, Meriden, Conn., plant manager; **William J. Ryan**, Bristol, Conn. plant manager; **Hubert J. Gurske**, Sandusky, O. plant manager; **Edwin H. Goodridge**, general production manager in charge of production and purchasing; **Harry T. Burgess**, Bristol plant production manager; **Raymond J. Lynch**, assistant chief engineer; **Wallace F. Dunn**, manager of bearing applications; **Matthew C. Wagner**, Meriden plant personnel manager; **Harry D. Hall**, divisional supervisor of processing; **Kenneth D. Mackenzie**, assistant Meriden plant manager; **Henry J. Michelsen**, master mechanic; **William T. Murden**, coordinator of defense activities; **Edward E. Gill**, director of public relations.

Norton Co.—**Curtis M. Clark** of the Legal Dept. has been appointed counsel. **Elmer B. Jones** has retired as general traffic manager, but is being retained as traffic consultant.

The Hydraulic Press Mfg. Co.—**John M. Dolan**, vice president and general sales manager, has been appointed to the company's board of directors. **William S. Renier** has been appointed director of engineering.

Lear, Inc.—At the annual meeting of the stockholders, **Kenneth MacGrath** was elected to the board of directors.

General Motors Corp., Chevrolet Motor Div.—**John K. Smyth** has been named superintendent of the Oakland, Calif., plant.

North American Aviation, Inc.—**Stanley C. Hellman** has been appointed assistant general manager of the Columbus, O., division.

Mack Trucks, Inc.—The election of **E. J. Dinkel** as secretary has been announced.

Mack Mfg. Corp.—**J. A. White** has been elected a vice president.

General Motors Corp., Rochester Products Div.—**Ralph B. Knight** has been appointed general manager.

The Bullard Co.—At a meeting of the board of directors, E. P. Bullard resigned as chairman of the board of directors, and the Board unanimously voted to name him chairman of the board emeritus.

Ex-Cell-O Corp. — Donald H. McIver was elected to the office of vice president in charge of industrial sales.

Ex-Cell-O Corp. — At a recent board meeting, George D. Scott was elected vice president in charge of Pure-Pak Sales.

Westinghouse Electric Corp.—**E. W. Ritter**, manager of the company's new Electronic Tube Div., has been named a vice-president. **E. V. Huggins** has been elected to the position of executive vice-president of the Westinghouse Electric International Co. **William G. Marshall**, vice-president in charge of industrial relations, has retired.

Goodyear Tire and Rubber Co., Aviation Products Div.—**J. E. Leonard** took over as manager of the Landing Gear Dept., and the Industrial Brake Dept. will operate as a separate unit with **C. A. Hulsemann** as manager.

Necrology

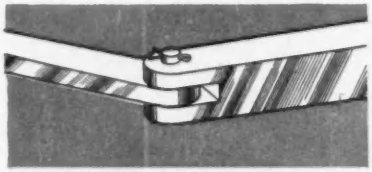
John Wilkinson, 83, automotive pioneer and inventor, died in Syracuse, N. Y., on June 25.

G. Geoffrey Smith, 67, directing editor of *The Autocar* and other automobile publications of the Iliffe Co., London, England, died at Radlett, Herts., England, on June 26.

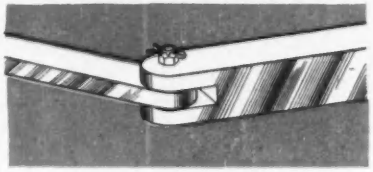
Edwin H. Parkhurst, 79, president, Euclid Road Machinery Co., died in Cleveland Heights, O., on June 22.

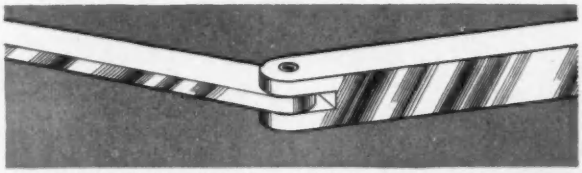
How to replace hinge pins and cotter pins with ROLLPIN self-locking fasteners

Rollpin replaces hinge pin for faster assembly of hinges. Inexpensively and simply driven in place, it cuts assembly costs. Constant spring tension holds Rollpin firm against vibration on heavy-duty automobile door hinges—on lightweight sheet metal hinges for meter or instrument panel covers.



IF YOU DO THIS ▲ *OR THIS* ▼ . . .





TRY THE ROLLPIN WAY INSTEAD . . . Rollpins offer many advantages as pivot and clevis pins for linkages or yoke assemblies. Heat-treated to provide excellent fatigue resistance and wear characteristics, Rollpins fit flush, grip firmly in the outer or inner members, depending on your design requirements, and are simply, inexpensively pressed in place. They are faster to install than cotter pins or safety wire . . . straight edges protect workers' fingers and clothing. Rollpins are readily removed with a punch . . . can be used again and again . . . assure simplified maintenance.

USE ROLLPINS (1) To replace set screws and rivets. (2) To pin or key gears . . . pulleys . . . levers . . . knobs. (3) As locating dowels, stop pins or shafts for small gear trains.

Once you test their effectiveness you'll want the secure, vibration-proof fastening of Rollpins in your products. Write now for a sample package and full details. Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, N. J.

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GET YOUR FREE TRIAL ASSORTMENT OF ROLLPINS.

Mail this coupon now.

Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, N. J.

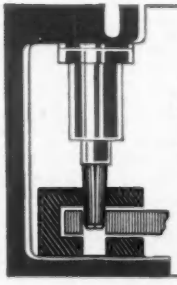
Please send me full application data and test samples of the Rollpin.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____



HERE'S HOW ROLLPINS PROVIDE A VIBRATION-PROOF FIT

Rollpins are easily pressed into production drilled holes—chamfered ends facilitate automatic or manual insertion.

Rollpins compress as they are driven—are self-retaining in production drilled holes—fit flush. Secondary hole-reaming or riveting operations are eliminated.

Constant spring tension against walls of hole lock Rollpins permanently in place until deliberately removed with a pin punch. Rollpins don't damage the hole and can be used again and again.

"MX" PRODUCTS

...works fast, works safe!

"MX" Products by CARBORUNDUM are made from cotton fibres and selected abrasive grain types combined with specially developed organic bonds. They retain fast cutting action for extended work periods and feature a high safety factor. "MX" products include plain, straight or depressed center wheels for portable grinders. These wheels meet the varied needs of portable grinding in cut-off, slotting, edge breaking, deburring, weld grinding and surface finishing operations, and all these operations can be performed with maximum safety. Use "MX" products and reduce the necessity for wheel changes.

Only CARBORUNDUM
TRADE MARK

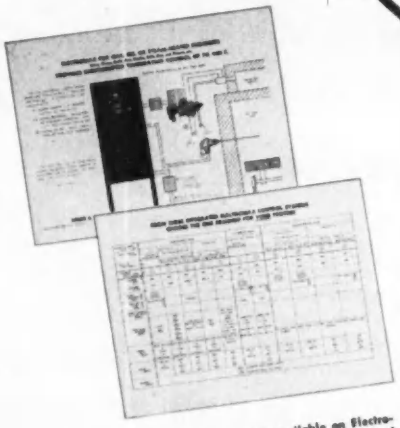
makes ALL Abrasive Products ...to give you the proper ONE

"Carborundum" and "MX" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N.Y.

81-16A

Dependable temperature control to 1000 F

Connection between the instrument and its primary element (a Thermohm temperature detector) is wire . . . not tubing. Can be any length without effecting accuracy or dependability.



Typical samples of the information available on Electromax Control. Specify nature of process and whether fuel is gas, oil, steam or electricity.

ELECTROMAX Controllers give modern electronic regulation to thousands of important manufacturing processes. In any application up to 1000 F they exactly fill the bill for non-recording controllers of outstanding dependability.

Electromax has the sensitivity, accuracy and dependability of its big brother Speedomax Recording Controller. Likewise, it is not affected by vibration or building tremors . . . can even be mounted on the frame of a molding press. The instrument needs almost no attention, because it has only one moving part . . . a covered plug-in type relay. There's usually no need to open the instrument door for months at a time.

Electromax Control is available to provide any one of three control actions. For the more simple process requirements, on-off or two position control is usually used. For processes requiring control within unusually close limits, two different types of proportional control are available . . . Position-Adjusting Type and Duration-Adjusting Type. All three types of control action can be applied to electric, steam or fuel heating.

For further information, write our nearest office, or 4966 Stenton Ave., Phila. 44, Penna.

MEASURING INSTRUMENTS TELEMETERS AUTOMATIC CONTROLS HEAT-TREATING FURNACES

LEEDS & NORTHRUP CO.

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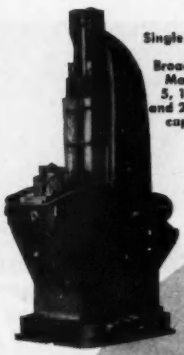
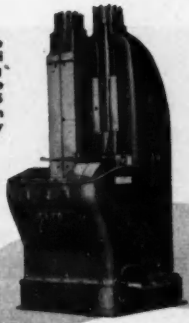
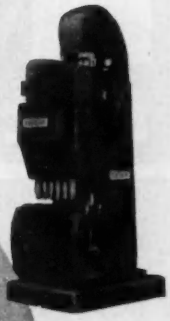


Single Slide and Broaching Machine 5, 10, 15 and 25 ton capacity



Duplex Surface Broaching Machine 5, 10, 15 and 25 ton capacity

Continuous Type Broaching Machine Built in Four Sizes



Stub Type Cylinder Boring Machines

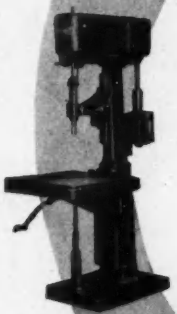
FOOTBURT LINE OF PRODUCTION MACHINES

engineered for production

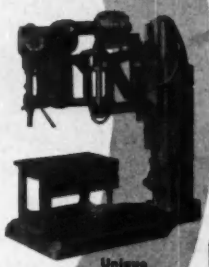
Way Type Drilling, Boring, Reaming, Tapping and Milling Machines with One, Two or More Ways . . . Station Type Machines . . . Center Column Type Machines . . . Cylinder Boring Machines . . . Inverted Drilling Machines . . . Surface Broaching Machines . . . Sensitive Drilling Machines . . . Hammond Radial Drilling Machines . . . Hammond Surface Grinding Machines . . . Manufacturing Type High Duty Drilling Machines . . . Independent Feed Drilling Machines . . . Special Machines.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

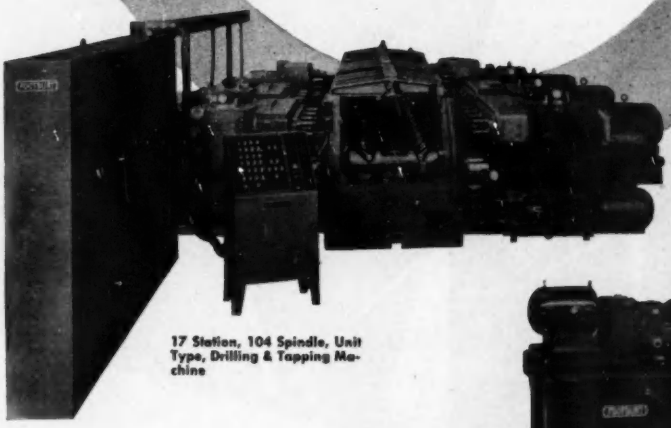


1, 2, 3, 4 and 6 Spindle Sensitive Drilling Machines



Unique Bracket Type Hammond Radial Drilling and Tapping Machine

Extremely Accurate Hammond Tool Room Grinder



17 Station, 104 Spindle, Unit Type, Drilling & Tapping Machine

Five Way 21 Spindle Lead Screw Tapping Machine

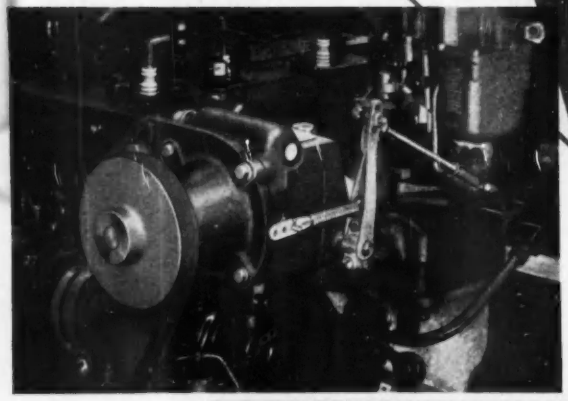
FOOTBURT *production machine tools*

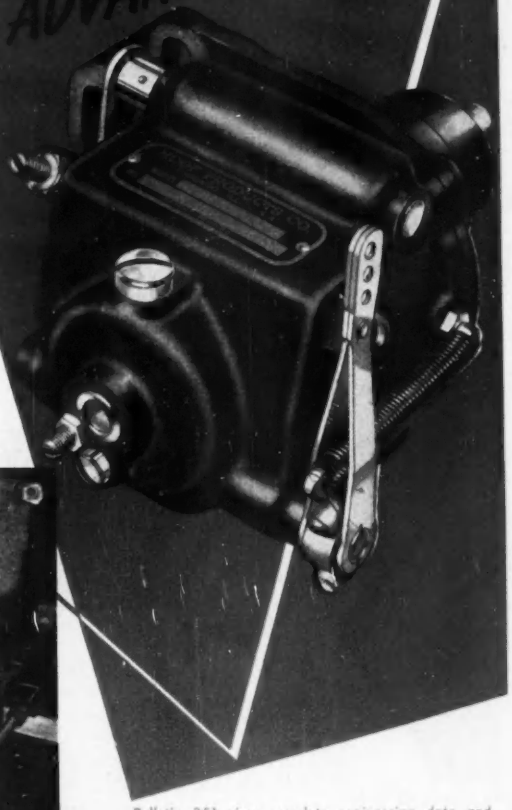
. . . a time tested line of machine tools

HOOF
Mechanical Governors....

3 Provide IMPORTANT ADVANTAGES....

- Provide close regulation over wide operating range, without spring change.
- Employ ball or roller bearings at all load points.
- Do not require daily oilings; use oil seals throughout and have large oil capacity.





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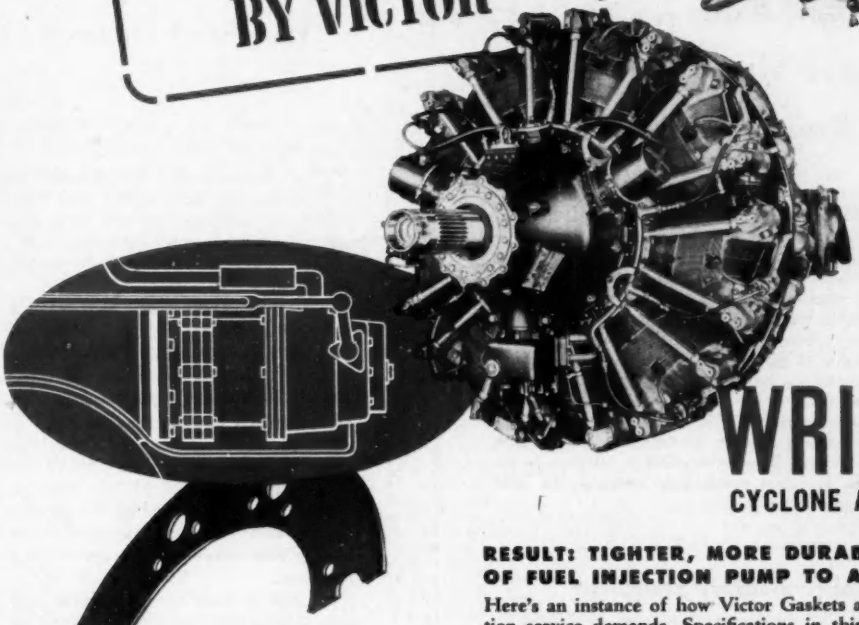

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Core of this flat-type, flush-fitting laminated gasket is copper, machined to closest tolerances on all dimensions and openings. Sealing element which is chemically bonded to both faces is VICTOPAC—a Victor-developed, highly compressed rubber-asbestos sheet packing made of select long fiber asbestos and special heat-resisting synthetic rubber.

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Here's an instance of how Victor Gaskets are meeting aviation service demands. Specifications in this case called for sealing gasoline under pressure with a thin flat-type gasket. Required were high compressibility and strength, with maximum resistance to erosion and gasoline effects.

For this application, Wright Aeronautical engineers found a ready answer in Victor "Sealed to Order" service, resulting in the Copper-VICTOPAC laminated gasket shown at left.

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How to

By Kenneth G. Smith
Financial Consultant

THE Renegotiation Board as set up under the Act has the authority, after weighing all the facts and data presented by the contractor, to reclaim any profit considered to be excessive.

Before proceeding any further with the reading of this article, stop and reread the above sentence. Now ask yourself: *"Is my company preparing itself for renegotiation?"* Just what protective measures can we take to insure a more intelligent determination on the profit margin to be retained under the Renegotiation Act of 1951? Bear in mind that the refunding of profits deemed to be excessive may prove to be a very real financial hardship to your company.

It may be that several months will pass before your company as a prime contractor or subcontractor has a sufficient volume of business to bring it within the scope of the Act. Don't postpone the adoption of the "protective measures" which should be installed in your company. Get started now to "be prepared" for renegotiation. In other words, here is the law. How much work does it entail to comply with the regulations and what is the most intelligent way to handle the problem?

Basis for Renegotiation

This great country is now embarked upon a vast program of military procurement as a defense against aggression. The Government expects all companies to do their full share on production of needed products. For this reason industry has been called upon to manufacture and deliver essential supplies and equipment against accelerated delivery schedules without sufficient opportunity to make accurate cost estimates for the production of such items.

The basis for the passage of the Renegotiation Act of 1951 is to eliminate

Important New Features of the 1951 Renegotiation Act

1. Inventory Cost Allowance

It is provided that there shall be excluded from consideration in determining whether or not a contractor or subcontractor has received or accrued excessive profits, that portion of the profits derived from receipts and accruals subject to renegotiation, which is attributable to the increment in value of the excess inventory. For this purpose, the terms "excess inventory" means inventory of the agricultural commodities, timber, the product of a mine, oil or gas well, or other mineral or natural deposit, contracts or subcontracts which are exempt from renegotiation, which is in excess of the inventory reasonably necessary to fulfill existing contracts or orders.

2. Partial Mandatory Exemption for Durable Productive Equipment

The provisions of the Act shall not apply to receipts or accruals (other than rents) from subcontracts for new durable productive equipment, except to that part of such receipts or accruals which bears the same ratio to the total of such receipts or accruals as five years bears to the average useful life of such equipment as set forth in Bulletin F of the Bureau of Internal Revenue (1942 Edition) or, if an average useful life is not so set forth, then as estimated by the Board.

3. Carry-Over of Loss

Permits excess of costs paid or incurred with respect to renegotiable contracts and subcontracts in any fiscal year over the amount received or accrued in such fiscal year to be carried over and applied as an item of cost in the next succeeding fiscal year, subject to regulations of the Board. Such excess is allowed as a carry-over only to the extent that it did not result from gross inefficiency of the contractor or subcontractor, and no carry-over of such loss is allowed from a fiscal year ending prior to January 1, 1951.

Protect Yourself for Renegotiation

excessive profits from contracts having a direct and immediate connection with the emergency and National Defense.

It is anticipated that contractors will be asked to produce items not included in the customary output of their plants, as well as many items that are wholly new and unfamiliar to them.

The manufacturer may not be able to control the cost of materials required in the production of his products nor regulate the labor cost that is necessary to complete the contract. Offsetting these factors he has an accelerated production schedule based on volume requirements which may greatly increase his profits.

The magnitude of the defense program is such that it will entail the procurement of supplies in enormous quantities far in excess of ordinary commercial levels with consequent inevitable effect on production costs.

For these reasons it is evident that contractors and contracting officers will be unable in countless instances to make accurate forecasts of costs on which to base prices. Therefore, close initial pricing will be almost impossible to achieve.

The procurement of needed military supplies and equipment cannot be delayed for the completion of cost and price analysis that might otherwise be made as an incident to careful purchasing.

It is anticipated that specifications, quantities and delivery rates will be revised from time to time in the light of experience and to keep pace with the fluctuations of actual or threatened military situations.

Renegotiation provides the means for the Government to start industrial production on needed defense materials and, through analysis of costs with consideration of all factors, arrive at a profit deemed to be proper for the work performed by a given contractor.

KENNETH G. SMITH, the author of this article, is a management and financial consultant with a diversified background in banking, industrial and Governmental work, having served on the Army Signal Corps Renegotiation Panel during World War II. He prepared termination claims for the Firestone Tire & Rubber Co. and for a number of years was employed by the banking house of Drexel & Co. Mr. Smith is the author of various articles on accounting and finance.

At the present time Mr. Smith is a consultant on renegotiation to trade associations, chambers of commerce, banks and industrial concerns. As Renegotiations Adviser for AUTOMOTIVE INDUSTRIES, he has offered to answer inquiries on the subject addressed to this publication.

Sales Subject to Renegotiation

The 1951 Act provides that all amounts received or accrued by a contractor on and after Jan. 1, 1951, and attributable to performance after June 30, 1950, are subject to renegotiation if they aggregate more than $250,000 in the fiscal year. However, contract brokers whose income is derived from fees or commissions based on contracts or subcontracts for any year in which receipts or accruals are more than $25,000 are also subject to renegotiation.

Contracts with the following Governmental agencies are subject to renegotiation:

1. Department of Defense
   a. Army *b.* Navy *c.* Air Force
2. Department of Commerce
3. The General Service Administration
4. The Atomic Energy Commission
5. The Reconstruction Finance Corp.
6. The Panama Canal Co.
7. The Canal Zone Government
8. Housing and Home Finance Agency
9. Such other agencies of the Government exercising functions in connection with the National Defense as the President shall designate.

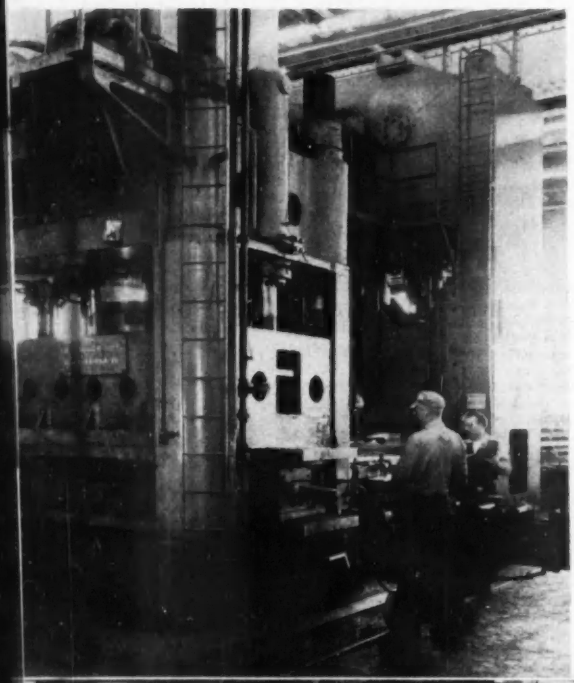
We now face our first major problem—segregation of sales. The absence of a renegotiation article or clause in a prime contract or lack of notification on purchase orders or subcontracts does not preclude the application of the Act. The end use of the product determines its inclusion in renegotiable business. It is the contractor's responsibility to segregate sales and to advise the Board how he arrived at the final figure. The basis for segregation of sales must be consistent with good accounting principles and be acceptable to the Board. The methods most commonly used and which have been approved in the past include the following:

1. Actual method is where prime contracts, subcontracts, purchase orders, etc., can be clearly identified as National Defense business.
2. An allocation method based on industry, customer or consumer group use of the product.
3. Product or product group classification which clearly indicates the potential end use of the article.
4. Where a division, department or plant of a company is devoted entirely to National Defense work.
5. An allocation method based on Government, trade

(*Turn to page* 124, *please*)

Heavy Equipment for Making

Close-up of 2500-ton HPM hydraulic press for forming mold boards. The blank—¾-in. thick and 140 in. long—is heated in an adjacent furnace to a temperature of 1750 F to facilitate this heavy forming operation. Not only is the work-piece formed to the desired curvature but a large central area is dished out of the plane of the major area.

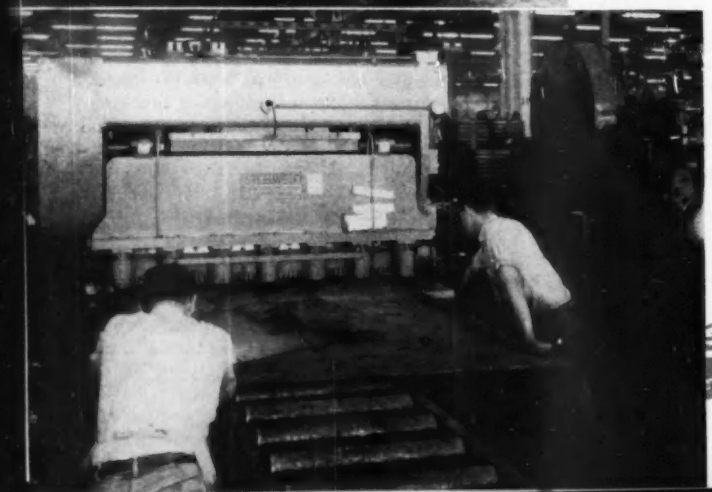


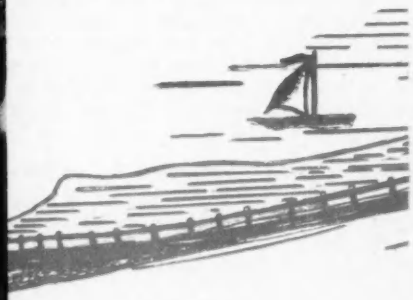
PLACED in operation late in 1949, the latest of the Caterpillar Tractor Co. plants—the Steel Fabrication Factory—is designed for the production of scrapers and rippers, and includes facilities for fabrication of heavy components for these big road building machines. It has a floor space of 820,500 sq ft. For worker comfort, a blower-exhaust fan system is arranged to circulate 1,800,000 cfm of air.

Altogether Caterpillar has over 500 pieces of welding equipment throughout its plants, about 75 per cent of this number being located in the L-L plant. In addition, the building houses 11 presses with a capacity of 500 tons or over. They also operate a battery of 14 shears.

The fabrication of large heavy parts is one of the major features of this plant, with suitable equipment installed for the purpose. For example, the area devoted to the blanking and forming of large steel parts has some of the largest presses to be found in the industry. Here will be found large mechanical presses such as Clearing and Toledo, including a 1600-ton Clearing press used for blanking the main frame plate. Also, there is a goodly battery of HPM hydraulic presses which are particularly useful in the development of heavy draws.

(Below) This Steelweld (Cleveland Crane & Engineering Co.) steel shear represents an advanced type of shearing equipment. One of its principal features is found in the design of the shear blade which is hinged with a large radius of action, thus capable of exerting tremendous pressure at the cutting edge and assuring a satisfactory square cut edge. It is also provided with hydraulic hold-downs. The shear has a capacity up to ½-in. in mild steel, blade clearance being quickly adjustable for any thickness by means of a micrometer gage mounted on the side of the frame.



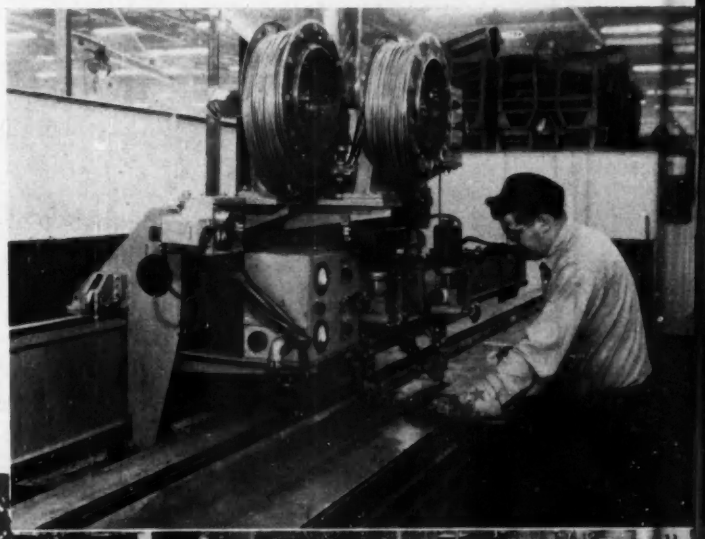


Large Road Building Machines

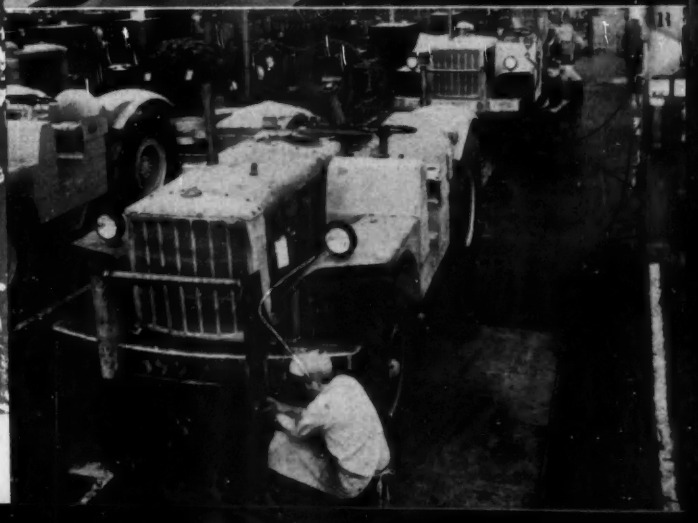
One of the illustrations shows the 2500-ton HPM for forming the mold board. The blank, ¾-in. thick, and 140-in. long is heated to 1750 F for the operation. The largest of these presses is a 3500-ton HPM Fastraverse machine used for blanking and forming heavy steel parts. In addition are a 2000-ton, triple-action HPM, and two, 500-ton HPM units, one being of triple-action type.

Considerable heavy welding naturally is done in this plant—using both hand and machine methods, depending on the nature of the job. For machine welding they employ the familiar Lincolnweld hidden arc process equipment, primarily for long seam welds. The latest, and largest, unit of this kind is the one illustrated here. It is used for joining the side rail plate to the heavy section side rail to form a box-section. Two seams are required, each one running some 20 ft or more in length.

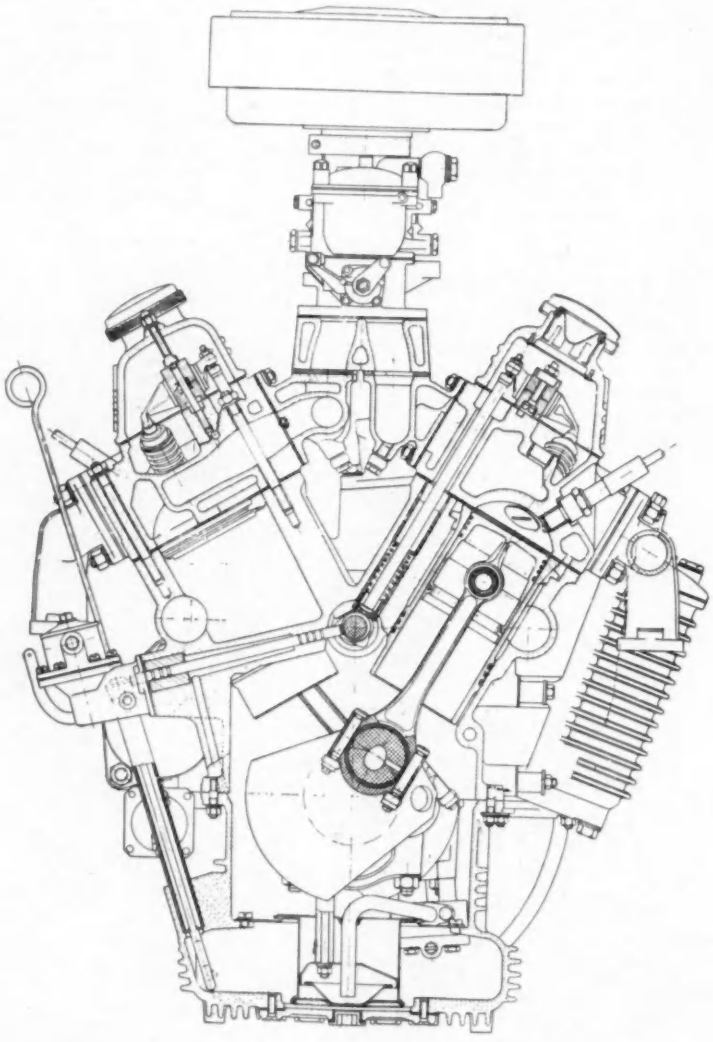
Heavy duty welding operations of manual and machine type are employed on a variety of parts. The enormous Lincolnweld hidden arc process welder seen here is an example of the latest and largest sized welding equipment in this plant. One of the jobs performed on this welder is the seam-welding of the thick plate to large side frames. Here there are two long seam welds, each one around 20 ft in length depending on the size of the rail. Basic features of the hidden arc process include: unusual soundness, great depth of penetration, and a relatively smooth weld which requires no further finishing. On side rails penetration is of the order of 7/16-in. deep.



(Below) In addition to facilities for heavy forming and fabrication in the L-L building, there are also assembly lines for the heavy duty road-building machinery. This view gives a perspective of one of several assembly lines.



Lancia Aurelia

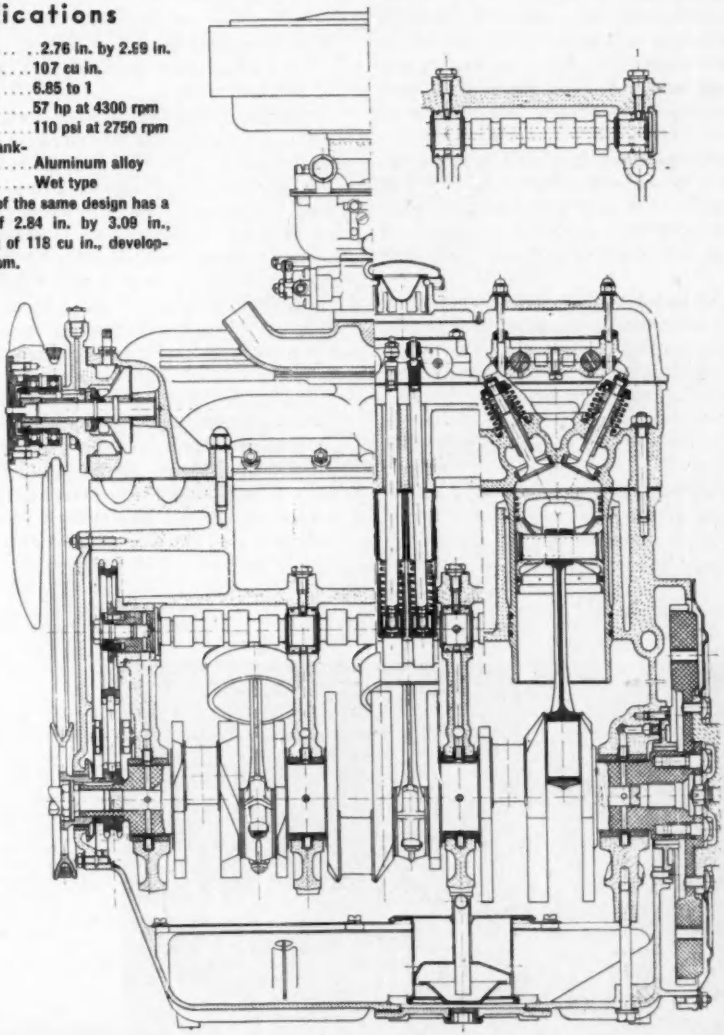


V-6 Engine

Specifications

Bore and stroke	2.76 in. by 2.59 in.
Piston displacement	107 cu in.
Compression ratio	6.85 to 1
Max. power	57 hp at 4300 rpm
Max. bmep	110 psi at 2750 rpm
Cyl. block, head, crankcase, pistons	Aluminum alloy
Cylinder liners	Wet type

A second engine of the same design has a bore and stroke of 2.84 in. by 3.09 in., piston displacement of 118 cu in., developing 75 hp at 5000 rpm.



Stretch Forming with

THE flexible stretch forming method now in use at Northrop Aircraft, Inc., was developed to fill a gap that existed in the range of part configurations, obtainable on extrusion stretch presses. Standard block types, made of plate laminations, were limited to single plane contours, and very small amounts of twist.

Many extruded derby sections used for fuselage stringers in the F89 required stretch forming to produce. They were for the most part contoured edgewise; however, some had compound contours and others carried up to 30 deg twist. All were 12 to 14 ft in length.

To produce laminated fixed contour stretch form blocks, for the aforementioned shapes, would have been nearly impossible and extremely costly. This led to the subsequent development of flexible stretch forming, which solved the immediate problem and cleared the way for more economical tooling, Fig. 1. It also contributed to a much wider versatility in stretch forming.

The complete setup consists of: A series of adjustable angle blocks; a base plate, containing a tapped hole pattern, Fig. 2; a flexible nesting work holder made of 0.091 in. thickness blank-pierced segments, strung on two wire cables and spring loaded to produce uniform deflection, Fig. 3. This supports the part throughout the entire forming operation. Uniform elongation is acquired through the flexual nature of the work holder.

Outward shape of the work holder, being square and parallel, allows for four positions of part rotation. Therefore it becomes the equivalent of four form blocks at any given contour. The adjustable contour feature is accomplished by setting up a series of angle blocks on the steel base plate. Blocks are located to a contour template and secured with Allen cap screws, and the entire assembly is then placed on the bed of the stretch press ready for operation, note Fig. 1. Subsequent contour changes are made in position on the press with an impact wrench adapted for Allen type cap screws. The flexible work holder is then placed on the angle block setup ready to receive the part. Standard stretch wrap forming procedure is followed to produce the desired results.

For flexible stretch forming on applications requiring only one contour, but several rotations of the part, a fixed contour flat face block is used, Fig. 4. This method is also excellent when applied to jobs having poor to impossible feed-in characteristics.

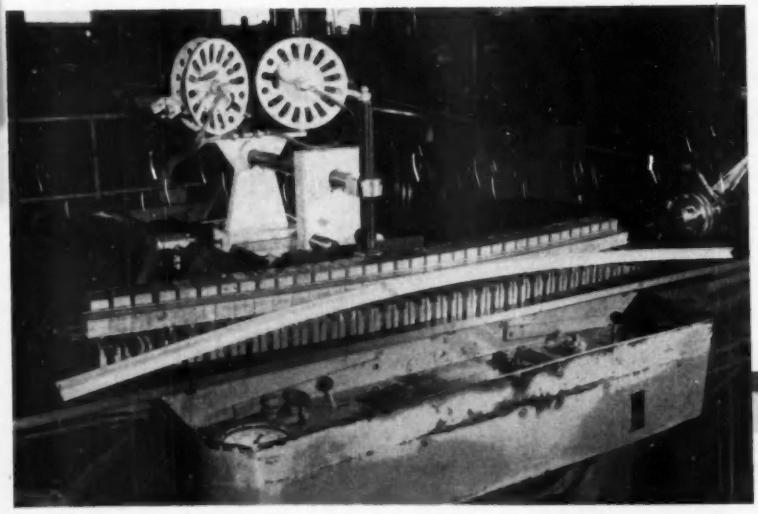


Fig. 1 — Flexible stretch forming setup for a part that is contoured on edge. The setup includes a series of adjustable angle blocks, a base plate, and a flexible work holder.

Flexible Equipment

The methods outlined here, and tools were not costly to produce—the flexible work holder, for example, required 37 hr including the blank pierce die, punch press time and assembly. The materials were scrap. Angle blocks are of cast Kirksite and the base plate is hot rolled steel, comprising a total cost of $600.

Continued development of this idea is being carried on at Northrop with the ultimate aim of producing a stretch forming machine or attachments that will meet high production requirements.

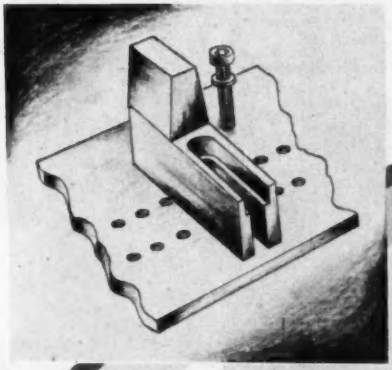


Fig. 2—Adjustable angle blocks are secured to the base plate by an Allen head cap screw.

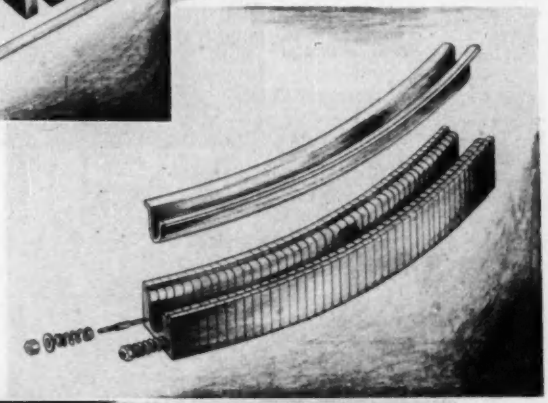


Fig. 3—Two wire cables, spring loaded, hold the blank pierced segments which make up the flexible work holder.

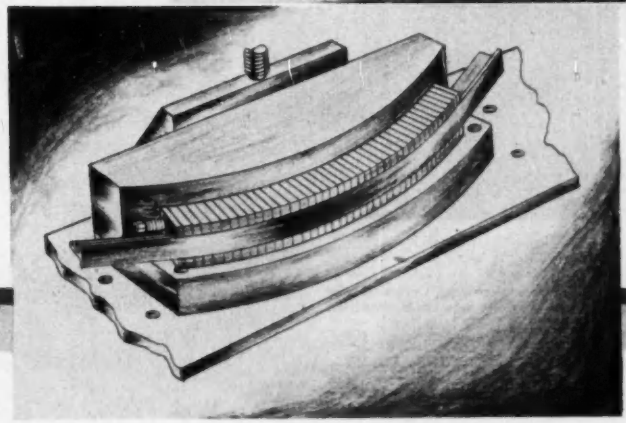


Fig. 4—This setup with a fixed contour, flat face block, is used for applications requiring only one contour but several rotations of the part.

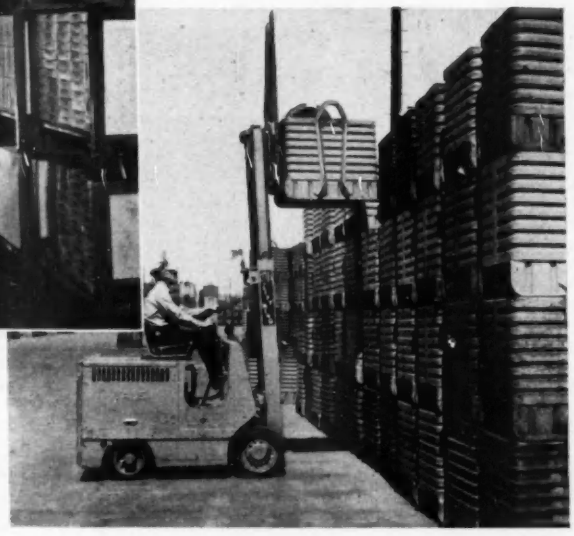
Versatile Materials Handling

In recent years Caterpillar Tractor Co., Peoria, Ill., has undergone tremendous expansion in plant facilities and has a large number of manufacturing and assembly buildings spread over a sizeable land area. Because of this, special attention has been paid to the organization of materials handling methods to eliminate manual handling and to facilitate the economic handling and storage of the variety of rough and finished parts and assemblies.

To cite one problem, the steel fabricating plant, which feeds the tractor assembly line, is located

Battery-powered industrial trucks such as the one seen here haul trainloads of materials throughout the plant. In this instance the truck is also toting a load on the fork end.

Yale & Towne power hand stacker demonstrates its utility in tiering light palletized loads in a crowded area.



Better utilization of outdoor storage at Caterpillar has been effected by tiering standardized steel containers using industrial fork trucks.

Setup at Large Tractor Plant

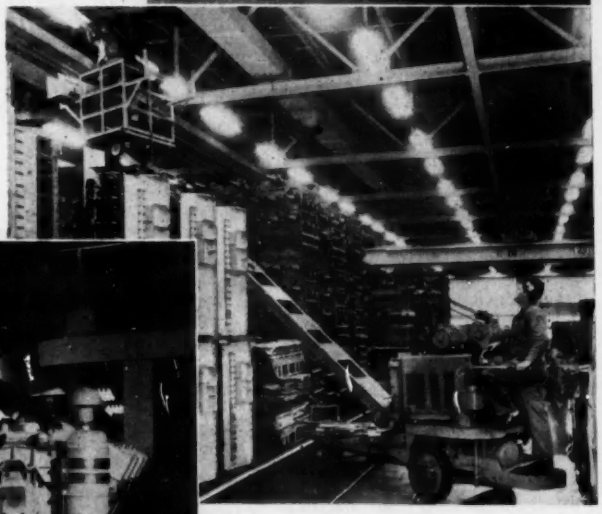
By Joseph Geschelin

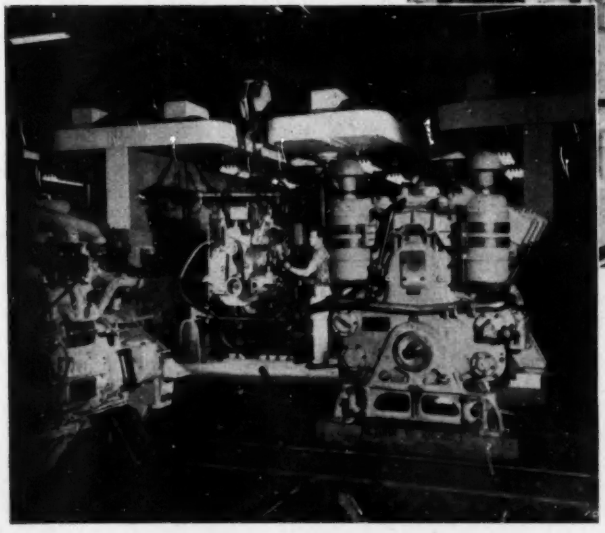
about eight blocks from the assembly line. Hauling in this case is done by means of highway tractor-trailer combinations. Since the truck fleet has grown to include 47 trucks and trailers, quick communication is being effected by the installation of a two-way radio system which permits dispatching from

(*Turn to page* 104, *please*)

Industrial trucks are employed for special duties as well. Here is a heavy duty fork truck loading and unloading tools and dies in the storage racks.

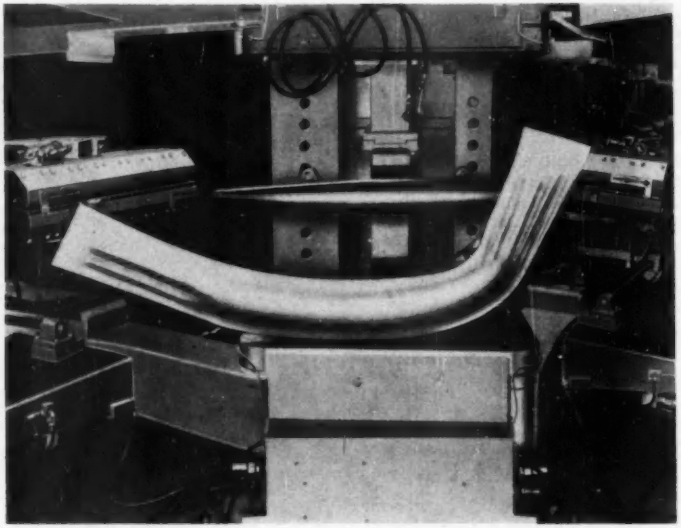
Gravity roller conveyors and power-driven assembly conveyors are found in profusion in manufacturing areas. This view, in the Diesel engine plant, shows large assembled engines stored on gravity roller conveyors in the engine test department. In the background may be seen part of the large installation of double test cells. When an engine is ready for mounting on the dynamometer stand, it is lifted off the conveyor by means of the heavy duty overhead crane and transported directly over the test cradle. It is of special interest that the ceiling of each test cell is suitably recessed to permit entry of the crane hook directly into the cell.





Another special application of the versatile industrial truck is this boom model used by the maintenance department. Here it may be seen as used for replacing ceiling fluorescent lights in the Diesel engine building.

Forming Problems with



This stainless steel wing tip is stretch formed. Material in this part is AN-S-757, annealed condition, 0.025-in. thick.

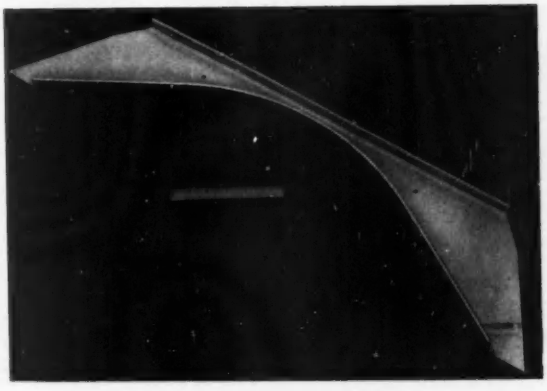
THE fabrication of stainless steel sheet parts now requires a greater percentage of manhours and tooling than ever before due to the greatly increased use of stainless in structures subjected to high temperatures. Where reciprocating engined aircraft utilized stainless steel firewalls and exhaust ducts in a relatively limited area, the jet engine now imposes the use of stainless in whole fuselage sections, long exhaust ducts and shrouds from engine to tail outlet. Manufacturing departments have learned to "live with it" by experience, by necessary improvement in design and by putting more time and effort into high cost tooling. This article points out some of the advantages and limitations to the use of stainless steel based on a report by North American Aviation.

In aircraft manufacture, the stainless steel materials most used are the so-called 18-8 alloys, AISI Types 302 and 347. Their aircraft specifications are AN-QQ-S-772 and AN-S-757. The former, Type 302, is unstabilized, therefore cannot be fusion welded, but is available in both annealed and half hard condition. Type 347 is annealed, stabilized, weldable by resistance or fusion welding techniques, can be silver brazed and is suitable for locations where service temperature exceeds 700 F. Both types can be spot-welded but neither of them can be heat-treated.

A strength/weight comparison of some of these alloys and titanium to 75S-T6 aluminum alloy is given in Table 1.

The techniques for forming 18-8 annealed stainless are similar to those for annealed aluminum alloys, since it has very high elongation, though a more limited possibility for shrinking. However, the technique of forming half hard sheet is one of elongating only and difficult for three principal reasons; it is tough, with lots of spring-back; for all practical purposes it is incompressible (punch-press forming not excepted); and the mechanical properties are not uniform from piece to piece, either from sheet to sheet or within the same sheet of raw stock.

Thus, 18-8 annealed stainless is good material for drop hammer, punch press, stretch machine, hydro press and spinning lathe methods of forming but half



Stainless Steel Sheet Metal

hard cannot be formed where an element of shrinking is involved as in the drop hammer, punch press draw forming or convex flanges on the hydraulic press.

The best gage of the formability of stainless steel parts can be taken by considering some specific examples.

The yoke shown in Fig. 1 is one of three similar parts on different contracts which were designed using stainless steel sheet. As originally made from half hard stainless, both flanges were to be formed at one stroke in a punch press die, Fig. 2. Residual stress remaining in the inside flange after forming caused a bow which could not be successfully removed except by extensive handwork by a skilled metalsmith. This might have been overcome if the material used was uniform in mechanical properties from one piece to the next. Material was changed to air-hardening stainless formed in annealed condition and heat treated.

A second similar part, Fig. 3, was designed also in half hard stainless sheet but due to the relation between width and inside radius it was possible to stretch form the inside contour. During stretching the material was greatly work hardened with elonga-

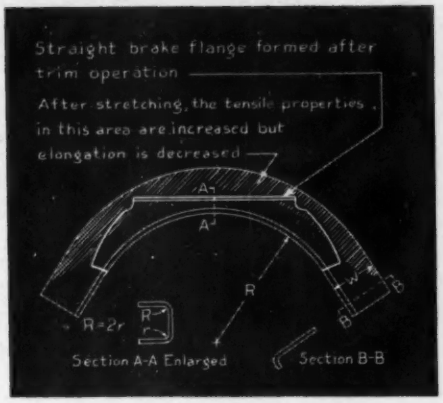


Fig. 3—Yoke fabricated by stretch-form technique.

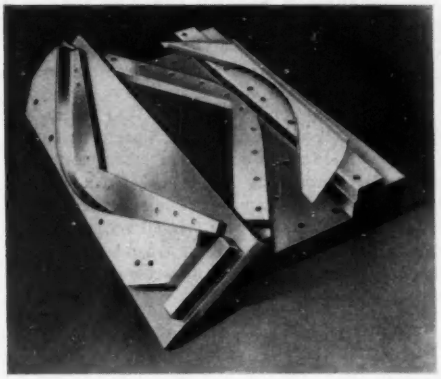


Fig. 2—Yoke and punch press form die with the pressure plate omitted.

Fig. 1—This yoke was originally made from half hard stainless but because of fabrication difficulties air hardening stainless—formed in the annealed condition and heat treated—was used.

Table 1

Comparative Typical Properties of 75S-T6 Aluminum Alloy, Commercially Pure Titanium and Type 302 Stainless Annealed and ½ Hard

FOR FABRICATION ONLY*

Property	75S-T6	Titanium	TYPE 302 Annealed	TYPE 302 ½ Hard
Ultimate Tensile Strength, psi	82,000	80,000	75,000	150,000
Yield Strength, psi (.2% offset)	72,000	70,000	30,000	110,000
Elongation, % in 2 inches*	8	20	40	15
Density, lbs. per cu. in.	.101	.162	.29	.29
Ultimate strength/weight ratio (Ultimate psi / Density x 10^3) at 70° F	811	493	258	516
(Yield psi / Density x 10^3) at 70° F	712	432	134	379
Linear coefficient of expansion in (inches/degree F)	12.0 x 10^{-6}	5.0 x 10^{-6}	9.6 x 10^{-6}	9.6 x 10^{-6}

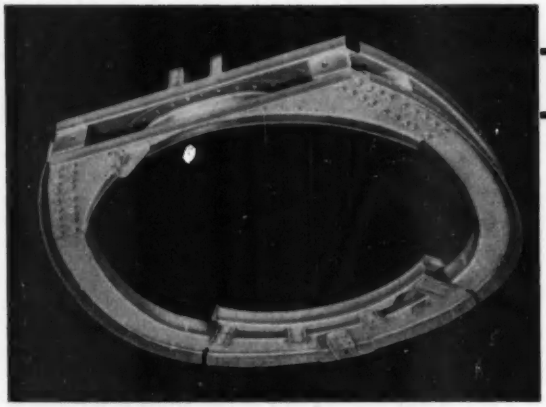


Fig. 4—Perpendicular single-piece hat section fuselage frame.

tion along the outer periphery of the curve, decreasing to approximately that of three-quarter hard temper. Thus, the bend radius for the straight brake-formed flange was necessarily twice as large as for the original material.

Another similar part had such radii and other dimensions that stretch forming as well as punch press forming was impractical for half hard material. Material chosen to begin with was heat-treatable stainless and punch-press-type tooling was ordered.

Beside spring-back, one of the chief problems in punch-press forming of stainless sheet is to prevent galling of the tools. If punch and die are hard enough they will not be marred by the material to be formed, but, in small areas, the stainless steel piles up on the tool causing marks which lead to fracture. As with other forming operations, the use of a good lubricant, such as chlorinated paraffin, will help prevent galling. However, it is necessary for those extremely difficult jobs to obtain the closest possible fit between the punch, die and material and, in several cases, the material has been ordered with the reduced thickness tolerance of ±.002 (at increased cost).

Up to the present there have been very few stainless steel sheet parts of compound curvature formed in half hard condition on any of the skin stretch machines. Its spring-back and limited elongation are mainly responsible, but one difficulty lies in gripping the material in the jaws securely to prevent failure before complete forming is accomplished. Edge condition is very critical, the more so with thin skins and each edge must be carefully polished to eliminate nicks. In general, stainless steel in half hard condition is unsuitable for skins.

Fig. 5—Canted built-up hat section fuselage frame. Several pieces are riveted or spotwelded together to form the unit.

Forming Problems

Type 18-8 annealed stainless is easily stretched to compound curves, much better than any of the aluminum alloys.

Due to the limitations in shrinking half hard stainless, much use has been made of the section stretching machine in fabricating parts with single plane curvature. The yoke in Fig. 3 is one example already cited. Fuselage frames in Figs. 4 and 5 are outstanding in that problems, typical of the extreme difficulties encountered in quantity production of half hard stainless parts, were met and overcome. One of these frames is a single-piece hat section while the other, due to its being a canted frame, was built up; i.e., several pieces riveted and spotwelded together to form a hat. The difference in tooling required for the two is impressive; 2800 tooling hr for the straight frame, 5716 hr for the canted frame.

Operations in fabricating the one-piece hat section are typical of parts formed on the stretch machine. The ratio of height (of hat section) to radius (of contour) results in approximately 18 per cent stretch around the outside of the curve, increasing mechanical properties but decreasing elongation. Such extreme stretch applied to half hard stainless renders the stretch forming operation very critical and, while control of the stretch machine is very sensitive, it became necessary to reduce tolerances all around in order to keep the rejection rate low.

Firstly, the material was purchased with specified

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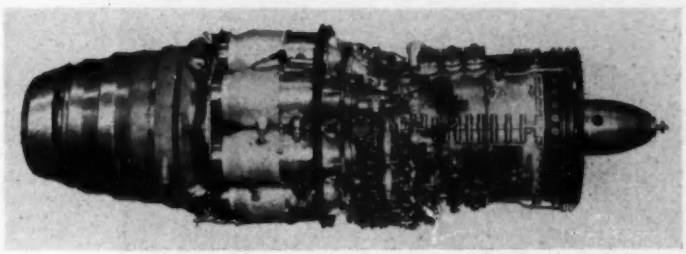
Latest Jet Engines Displayed At Paris Aviation Show

By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES



Rolls-Royce Avon jet engine. It weighs approximately 2240 lb, and develops a static thrust of 6500 lb at sea level. The Canberra bomber is equipped with Avon engines.

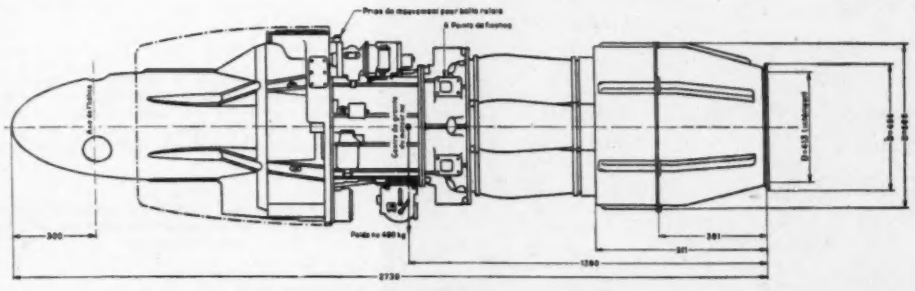
PARIS, FRANCE

PARIS staged its nineteenth international aviation show in the artistic setting of the Grand Palais and called on President Auriol to perform the opening ceremony. No existing building anywhere being of sufficient size to house modern aircraft, the Palais received mostly models, a complete range of power plants, and accessories. The Le Bourget flying ground was the scene, one week after the Palais opening, of a display of flying craft, and as a wind-up there was a big flying demonstration.

With only Russia and Germany missing, the Paris show was really international. The United States and England had dominating positions, although neither nation revealed all that it had produced or is on the point of producing. The British in particular explained that in many cases it was impossible for them to release more than general information on their latest types of planes and engines.

For the first time outside England, Rolls-Royce placed on view its Avon jet engine. This differs from the previous River class in having an axial-flow compressor, thus reducing drag and improving specific fuel consumption. The overall length is 119 in., diameter 42.4 in. and dry weight approximately 2240 lb. It is stated that it develops a static thrust of 6500 lb at sea level and that fitted in a Meteor plane it rose from sea level to 40,000 ft in considerably less than four minutes. This engine equipped the Canberra bomber (see AUTOMOTIVE INDUSTRIES, Feb. 1, 1951)

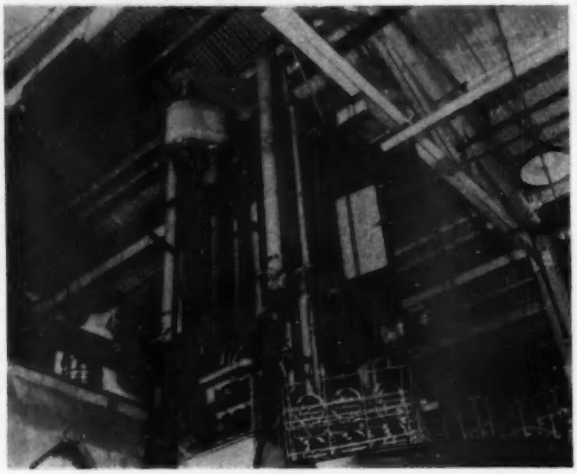
(*Turn to page* 106, *please*)

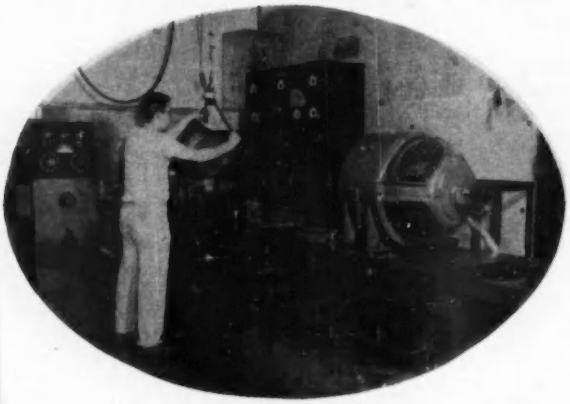


Line drawing of the first turbodrop engine to be built in the nationalized shops of S.N.E.C.M.A. in France. Its weight is 1050 lb, and output the equivalent of 2000 hp.

Many In

By Joseph Geschelin





BY lifting the curtain on its facilities for producing automatic transmissions for Ford and Mercury cars, the Warner Gear Division, Borg-Warner Corp., Muncie, Ind., completes another major phase of its rapidly expanding plant program. First phase of the postwar expansion in Plant 3—the new plant on the outskirts of Muncie—was recorded in AUTOMOTIVE INDUSTRIES, Jan. 1, 1949. Since then additional productive areas have been erected and equipped and the process of increasing roofed floor space is still continuing.

This article, intended as an introductory study of automatic transmission manufacture, will touch on just a sampling of major highlights. Succeed-

(Top) Here is the huge 30-ton, dual ram, American broaching machine for rough-broaching the helical internal gear in the ring. The first section of the big broaching tools is designed to cut a round bore to facilitate entry of the pressure cutting section.

(Oval) One of the six final test stands on which the drive is tested for all maneuvers, noise, and indications of leakage.

(Left) View of corner of the air-conditioned automatic drive final assembly department. This shows several of the sub-assembly benches as well as one of the numerous testing machines for qualifying component assemblies, the regulator, in this case.

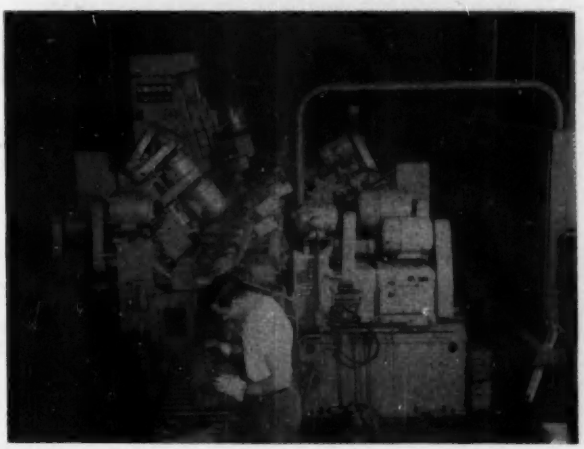
Close-Tolerance Operations Machining Ford-Mercury Automatic Transmissions

Automotive Industries Presents in This Issue the First of a Series of Production Articles Describing Important Metal Working and Assembly Operations on This New Development. This First Article Deals with Production at the Warner Gear Plant in Muncie, Ind. The Next Article, to be Published in an Early Issue, Will be Devoted to Techniques at Ford's Cincinnati Plant.

ing articles are planned to cover the project more completely.

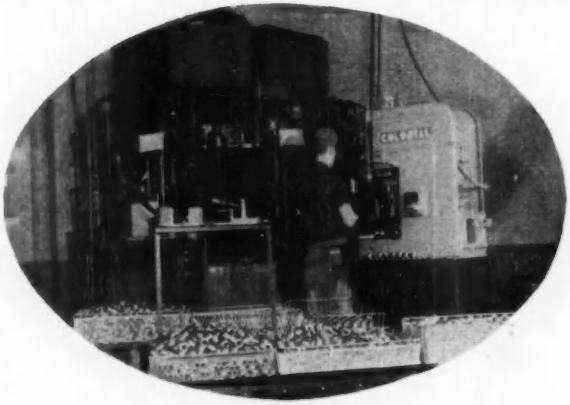
Because of the innumerable new problems incident to the manufacture of a highly specialized mechanism such as the Ford automatic transmission, their solution has demanded skillful analysis as well as the development of special techniques and special machinery. Prominent in the set-up are three big transfer machines — two Cross Transfermatics on the case; and a Baush transfer machine for the planetary rear drum. Other items of interesting equipment will be mentioned in connection with the machining of specific parts, although at this point it may be noted that Ex-Cell-O, New Britain, and Heald precision-boring equipment of various types is found in profusion.

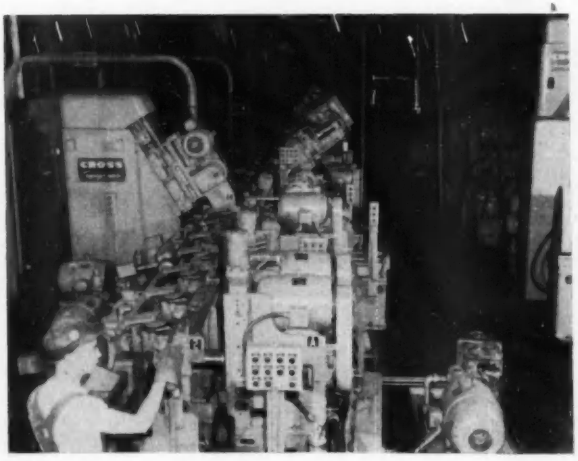
Materials handling by various mechanized means is very much a part of production planning, in fact, inseparable from the operation itself. Generous use is made of monorail conveyors for



(Oval) One of the Michigan Tool gear finishers used for shaving various gears. A feature of these machines is the track-type feeder conveyor with provision for automatic unclamping at the work station.

(Right) Perspective view of the 28-station Cross Transfermatic machine, the first one in the line, tooled for drilling, reaming, chamfering, spotfacing, and tapping front and rear faces and dome of the case. Fully automatic in operation, it requires only loading and unloading of the work.





transporting parts to and from the machines. Gravity roller conveyors are installed at many points, and one of the major keys to economic handling in this plant is the development of palletizing, using special wire containers designed by the company.

Incident to the machining of many cast iron parts, particularly large ones such as the transmission case, Warner Gear has had to find a solution to the basic problem of dimensional stability as well as good machinability so essential to mass production requirements. To meet this situation all cast iron parts regardless of size are given a stress relief treatment, before machining, by heating in a Hagan furnace at 1050 F for a total heating and cooling cycle of around 3½ hours. This has been found effective in holding dimensional stability on intricately machined parts subject to close tolerances.

Immediately upon emerging from stress relief, castings not machined all over are put through a large automatic Kolene cleaning unit in which they are held in a heated bath of nascent liquid salt of special formulation, then transported into a cold water rinse, followed by a hot water rinse to promote air drying. This procedure has been in use long enough to demonstrate that it has the salutary effect of removing all scale, and dissolving sand embedded in the surface as well as in ordinarily inaccessible pockets. It is obvious, too, that this procedure also effects the

(Top) This is the enormous Cincinnati special Duplex mill, combining rough- and finish-milling as well as drilling and reaming of dowel holes in the case.

(Oval) One of the new eight-station Cleveland Rigid hobbers set up for cutting gear teeth in planetary pinions. The Colonial press at the right is used for pressing gears on special arbors for this operation.

(Left) The second of the Cross Transfermatics, seen here in perspective, is a 54-station machine running some 92 ft in length. Here the work is received directly from the first Cross unit for operations on the pan face of the case—milling, drilling, reaming, spotfacing, chamfering, and tapping.

chemical cleanness so essential in this operation.

Coming to a sampling of manufacturing steps, consider first the case which is the backbone of the entire mechanism. First operation, following Kolene treatment is a series of roughing operations—turning, facing, main line boring, etc.—in a No. 422 Heald double-end Bore-Matic. Next is the rough- and finish-milling of the pan face in a special Cincinnati Duplex, combination milling and drilling machine, fitted with a four-station indexing table. The third station handles the drilling, reaming, and chamfering of two dowel holes in the pan face for location in subsequent operations.

The front and rear faces then are rough- and semi-finish-milled in a No. 2A Davis & Thompson Roto-Matic. The case now is ready for the major sequence of operations in the two Cross Transfermatics.

The first of the Cross machines is a 28-station unit, having 81 operating spindles designed for a variety of details such as drilling, reaming, chamfering, spotfacing, end-milling, and tapping the holes in the front and rear faces as well as in the dome. As currently set up the machine has nine idle stations, Station 1 being used for loading while Station 28 is unloading.

Operations on the front and rear faces are completed by the time the case reaches Station 14. At this point, Station 15 has an automatic turntable

(Top) The special 15-station Baush transfer machine, shown here in perspective, is the third transfer machine found in this plant. As described in the text, it handles the planetary drum, performing the following general operations—drilling, milling, end-milling, countersinking, and reaming.

(Oval) Front view of one of the Red Ring gear shavers for crown-shaving long planetary pinions. Work is fed into the machine through the magazine in front.

(Right) Close-up of a section of the final assembly conveyor on which the drive is built up.

which indexes the work by 90 deg to present the dome area for subsequent operations. It is of interest that certain stations, operating on the dome area, are fitted with carbide-tipped drills, carbide-tipped reamers, and Carboloy cutters. Taking into account the nine idle stations, this machine is provided with 17 work locating fixtures and 17 work clamping fixtures.

One of the major features contributing to the economy of operation of this Cross Transfermatic is the provision of the now familiar Tool-O-Meter fitted with a tool life timing control for each of the individual heads of the machine. In addition, the big board also contains two sets of stand-by tools for each head, with a presetting gage for setting the tools to proper length.

As the cases leave this machine they move directly into the larger Cross Transfermatic immediately alongside. A 54-station unit, it runs some 92 ft in length and is tooled for milling, drilling, spotfacing, chamfering, and tapping the pan face. Out of the total of 54 stations, 23 stations are idle, Station one being used for loading, 54 for unloading, leaving 29 actual working stations for which work clamping fixtures are provided.

The first ten stations of this machine handle milling operations. Altogether the machine has 106 working spindles, including several cemented-carbide-tipped spotfaces and reamers. Some of the drilling operations require the development of deep holes which are drilled part way through in successive stages. The milling cutters in the early stages all are fitted with inserted cemented-carbide blades.

This machine, too, is provided with its own Tool-O-Meter board and stand-by tools for each station. It is of interest that the timing dials on both boards are calibrated in terms of minutes of running time which, in effect, is a direct measure of number of holes or pieces. Tool engineers keep watch on performance at intervals with a view to making changes in the current calibration in accordance with accumulated experience.

Since the case is actually the backbone of the unit, responsible for housing the mechanism in perfect alignment, some special operations have been added at the end of the line to assure accuracy. For example, an Ex-Cell-O No. 54-2 double-end, double-spindle precision boring machine is used for finish-facing the boss adjacent to the bushing hole. This is followed by finish-facing the bottom of the large counterbore and finish-facing at other points on the rear face in a Bullard 20-in. three-spindle Contin-U-Matic.

Special arrangements also are made to provide special surface finish at certain points. Thus the small shelf within

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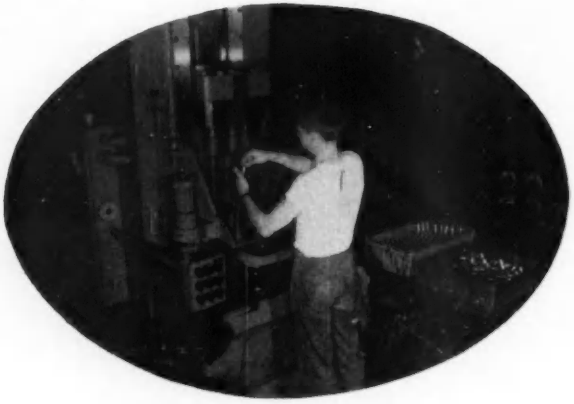

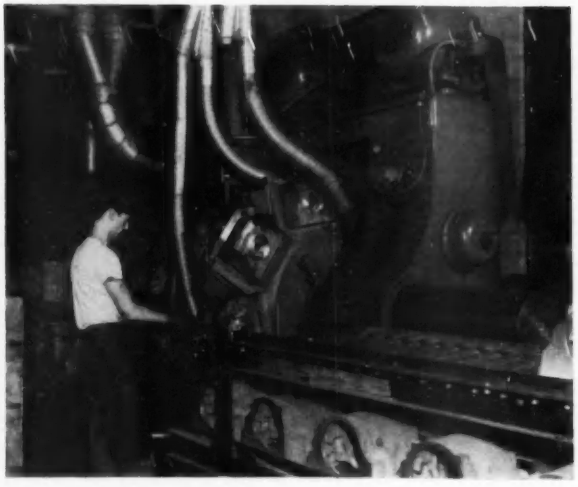

(Oval) This special American broaching machine broaches bore in planetary pinions prior to gear tooth hobbing.

(Left) Here is a close-up of the big Davis & Thompson Rota-Matic mill for rough- and finish-milling the ends of the case.

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4. Sell your entire organization on the need to scrap unusable material and equipment.
5. Prepare a complete inventory of idle material and equipment. Tag everything not in use.
6. Start it back to the steel mills by selling it to your regular scrap dealer.
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* Your DORMANT SCRAP is any obsolete, broken or wornout and irreparable machinery, tools, equipment, dies, jigs or fixtures, etc., that may encumber your premises. These, in the language of steel, are *scrap*, vital to steel production, and hence convertible into cash.

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The BUSINESS PULSE

With Personal Incomes Highest in History and Unemployment at a Minimum, Price Tendency Has Been Slightly Downward. Plant and Equipment Outlays of $6.4 Billion Set New Record During Second Quarter of This Year.

Contradictory Business Tendencies

The business situation shows few signs at present of settling down to easily diagnosed trends which allow confident forecasts. As one publication points out, there are too many "ifs" inherent in each premise. If controls are strengthened . . . if controls are relaxed . . . if Korean tensions ease . . . if raw materials are equitably allocated—these are imponderables which must be reckoned with, but in most cases each contains a prior "if" just as difficult to evaluate. Accordingly, business continues to show mixed and partly contradictory tendencies. Total production has been held approximately constant at the highest level since World War II. Civilian employment is at a record figure for the season. Unemployment is close to the practical minimum. Personal incomes are the highest in history and are rising. Yet the general price tendency has been slightly downward, and trade reports suggest recession in buying by business and individual consumers. These trends apparently indicate a continued rise in inventories on the one hand and a substantial increase in personal savings on the other.

This survey Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

The slow-down in buying is generally regarded as temporary, to be followed by an upsurge in the late summer and fall. This belief is based on various factors. Military procurement is scheduled to rise sharply during the remainder of the year; Federal spending will increase as deliveries, now lagging, are made on defense contracts; planned business expenditures for plant and equipment for the remainder of the year are even higher than they were a few months ago; and the rise in consumer incomes is laying the basis for further expansion of consumer demand.

Controversial Control Measures

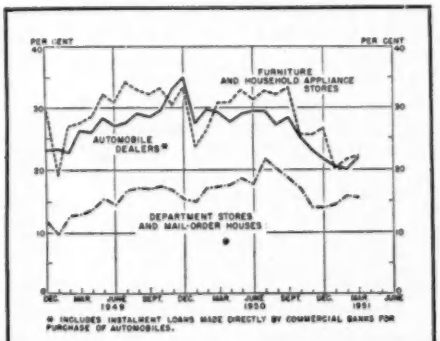
Though from the above point of view the prospect seems to be more or less favorable, the recent price declines and the scattered industrial layoffs (augmented by reports of probable midsummer layoffs in automotive plants) appear to have sharpened the controversies over extension and administration of Government controls—price controls, wage controls, credit controls, and restrictions on the use of strategic materials. The debate recently has centered mainly about the expiring vehicle of most controls, the Defense Production Act of 1950. As the debate reached its peak in the last week of controls under the original law, President Truman warned that failure to act would be "dangerous," but it would be "just as dangerous," he added, to rush through a new bill "so crippled and confused . . . that it would be worse than useless in the fight against inflation."

Rollback Prohibition Urged

At this writing, the extension of the Government's emergency powers in some form seems virtually assured, although the extent of the powers and the date of their termination are still uncertain. Committees of both Houses of Congress have recommended extension legislation, but for shorter periods and with less broad authority than the Administration requested. If the committee recommendations are followed, the term of extension will be either eight months or a year, instead of the two years asked by the President; the proposed rollbacks of beef prices will be prohibited; rollbacks in general may be out-

(*Turn to page* 134, *please*)

Too Much Regulation W



This chart, prepared by the Federal Reserve Bank of Chicago, shows the impact of Regulation W on installment credit granted, which is plotted here as a proportion of total sales at selected types of retail outlets, January, 1949 to March, 1951. Regulation W went into effect in September, 1950

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New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to April 26 authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods, which were published in the May 15 issue, page 94, of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Defense Production Administration between April 26 and June 22. Including this latest tabulation, 2132 new or expanded defense facilities of all types have been authorized for rapid tax write-off, the total amount eligible for amortization being $7,337,978,512 as of June 22.

— A —

Acme Electric Corp., Allegeny, N. Y.
Aircraft—$165,427

Aerojet Engineering Corp., Nimbus, Cal.
Ordnance—$2,065,465

Airquipment Co., Burbank, Calif.
Aircraft equipment—$68,583

Aluminum Co. of America, (Cressona Works) Cressona, Pa.
Extruded shapes for aircraft—$170,200

Aluminum Co. of America, (Lafayette Works) Lafayette, Ind.
Extruded shapes for aircraft—$600,000

Anderson, Inc., Chicago, Ill.
Wheels-brakes for aircraft—$17,987

Avco Mfg. Corp., Lycoming-Spencer Div., Williamsport, Pa.
Engines for tanks—$286,430

— B —

Bart Laboratories Co., Inc., Belleville, N. J.
Airplane parts—$8,454

Bendix Aviation Corp., (Pacific Div.) Burbank, Calif.
Research engineering—$24,463

Bendix Aviation Corp., Pacific Div. North Hollywood, Calif.
Ordnance—$184,119

The Benson Mfg. Co., Kansas City, Mo.
Gasoline tanks, aircraft, oil tanks—$511,127

Blaw-Knox Co., Groveton, Pa.
Aircraft—$240,000

Boeing Airplane Co., Wichita, Kans.
Airplane parts—$15,577

The Bridgewater Machine Co., Akron
Airplane parts—$56,051

Brown and Root, Inc., Houston, Texas
Tank hulls, turrets, turret covers—$1,502,000

The Budd Co., Philadelphia, Pa.
Turrets for tanks—$5,300,000

Bundy Tubing Co., Tamaqua, Pa.
Ordnance—$160,602

— C —

Cagnon Plating & Mfg. Co., Colorado Springs, Colo.
Aircraft—$1,875

Canton Drop Forging & Mfg. Co., Canton, Ohio
Forging—aircraft—$68,867

Carrier Corp., Dewitt, N. Y.
Tank hulls—$1,118,032

The Cessna Aircraft Co., Wichita, Kans.
Tail assys., aircraft components—$940,536

T. M. Chapman's Sons Co., Old Town, Me.
Engine parts—$20,916

Chicago Cutting Die Co., Chicago, Ill.
Carburetor parts—$12,034

Chicago Forging & Mfg. Co., Chicago
Aircraft—$130,232

Clary Multiplier Corp., Los Angeles
Aircraft—$35,512

The Coleman Co, Inc., Wichita, Kans.
Airplane parts—$347,135
Ordnance—$494,606

Chrysler Corp, Hamtramck, Mich.
Testing of engines, military trucks—$1,450

Crawford Door Co., Detroit, Mich.
Aircraft—$256,019

Cutler-Hammer, Inc., Milwaukee, Wis.
Aircraft—$7,474,327

— D —

Dana Corp, Toledo, Ohio
Transmission, gears (trucks)—$3,418,583

Detroit Aluminum & Brass Corp, Bellefontaine, Ohio
Friction bearings—$1,071,413

Douglas Aircraft Co., Inc., Santa Monica, Calif.
Airplanes—1,981,097

Douglas Tool Co., Hazel Park, Mich.
Ordnance, aircraft component—$60,000

Dow Corning Corp., Midland, Mich.
Silicon metal—$560,000

— E —

Eaton Manufacturing Co., Saginaw, Mich.
Aircraft engine parts—$199,223

Elgin National Watch Co., Elgin, Ill.
Aircraft parts—$60,812
Clocks for aircraft and tanks—$40,000

Evans Products Co., Plymouth, Mich.
Ordnance—$64,611

Evans Tool & Die Co., Detroit, Mich.
Machining castings—$59,243

Ex-Cell-O Corp., Fostoria, Ohio
Aircraft—$1,684,642

— F —

Foote Bros. Gear & Machine Corp., Chicago, Ill.
Aircraft—$127,795
Aircraft—$15,795

Frisby Machine Co., Inc., Freeport, N. Y.
Aircraft—$59,475

Fuller Mfg. Co., Kalamazoo, Mich.
Automotive trans.—$860,670

— G —

General Brass & Machine Works, Inc., Hillside, N. J.
Aircraft—$52,628

General Steel Castings Corp., Granite City, Ill.
Cast armor for tanks—$698,995

The B F. Goodrich Co., Akron, Ohio
Testing tires—$106,352
Track blocks for military vehicles—$48,270

The B. F. Goodrich Co., Troy, Ohio
Airplane parts—$107,285
Airplane wheels—$32,550

The B. F. Goodrich Co., Hood Rubber Co. Div., Watertown, Mass.
Airplane parts—$41,850

The Goodyear Tire & Rubber Co., Akron
Aircraft—$56,050

Goodyear Tire & Rubber Co, Inc., Los Angeles, Calif.
Earthmover tire repairs—$38,791

Gould-National Batteries, Inc., West of Kankakee, Ill.
Storage batteries—$2,962,626

— H —

Hackensack Cable Corp., Hackensack, N. J.
Aircraft, wire rope—$264,223

Hartford Tool & Die Co., Inc., Hartford
Parts for aircraft engines—$30,526

Hetherington, Inc., Sharon Hill, Pa.
Aircraft—$20,494

Hotpoint, Inc., Chicago, Ill.
Aircraft—$2,251,700

Huntingdon Machine Co., Inc., Huntingdon, Pa.
Ordnance—$17,500

— I —

Interstate Engineering Corp., El Segundo, Calif.
Aircraft parts—$94,826

— J —

Johnson Bronze Co., New Castle, Pa.
Sleeve bearings—$1,377,521

— K —

M. W. Kellogg Co., Jersey City, N. J.
Aircraft—$71,782

King-Seeley Corp., Dexter, Mich
Aircraft—$400,000

— L —

Langdon Mfg. Co., Glendale, Calif.
Latch assembly, aircraft—$6,495

Le Roi Company, Milwaukee, Wis.
Engine, air compressors, generator sets—$350,595

Liberty Products Corp., Farmingdale, N. Y.
Aircraft parts—$186,070

Lockheed Aircraft Corp, Burbank, Calif.
Aircraft—$1,077,745

Lockheed Aircraft Service, Inc., Burbank, Calif.
Maintenance of aircraft—$37,629

Lord Mfg. Co., Erie, Pa.
Aircraft—$29,030

Lundberg Mfg. Co., Inc., Jackson, Mich.
Landing gear parts—$29,828

— M —

The Marquette Metal Products Co., Cleveland, Ohio
Aircraft windshield wipers—$92,929

Glenn L. Martin Co., Baltimore, Md.
Aircraft—$176,043

McDonnell Aircraft Corp., St. Louis, Mo.
Airplanes—$111,425
Airplane & aircraft parts—$658,294

McGill Mfg. Co., Inc., Valparaise, Ind.
Roller bearings—$514,600

Monarch Aluminum Mfg. Co., Cleveland
Ordnance—$50,000

Morris Bean & Co. Yellow Springs, Ohio
Aircraft—$669,138

Murdock Machine & Engr. Co., Inc., Wichita, Kansas
Parts and assemblies for airplanes—$88,548

(Turn to page 94, please)

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New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

D-16 Automatic Transmission

The Texas Co.—The Studebaker automatic transmission is fully described and illustrated in Volume 37, No. 6 of the company's monthly, "Lubrication."

D-17 Undercoatings

American Chemical Paint Co.—A new pamphlet, 15-E, describes Lithoform, a liquid zinc phosphate coating, for galvanized iron, galvanneal, cadmium plated steel, zinc plated steel, and zinc base die castings.

D-18 Silicone "O" Rings

The Arrowhead Rubber Co.—Two new manuals which give complete information on "O" rings molded from silicone rubber compounds are now available.

D-19 Tubing

Samuel Moore & Co.—A new two-page bulletin titled "Dekoron Instrument Tubing," describes uses of the plastic-coated metal tubing where high corrosion resistance is required.

D-20 Brazing

Handy & Harman—Just released is a new bulletin, No. 54, on some applications and developments of Easy-Flo and Sil-Fos brazing alloys.

D-21 Machine Tools

Edlund Machinery Co.—Bulletin 140 gives complete information and specifications on firm's advanced design, Model 2F, drilling and tapping machines.

D-22 Pit Type Furnaces

The Hevi Duty Electric Co.—Bulletin, IND-451, illustrates and describes the use, construction and specications of pit type furnaces.

D-23 Barrel Finishing

Minnesota Mining & Manufacturing Co.—3M abrasives, compounds, and equipment for barrel finishing are described and illustrated in a new booklet.

D-24 Grinding Wheel Bond

Chicago Wheel & Mfg. Co.—The new vitrified silicon carbide grinding wheel bond, "XL," is described in a recently published four-page folder.

D-25 Tool Control

Carboloy Dept., General Electric Co.—Just issued is a new plan-book showing how the company's "CCC" plan for coordinated tool control can be used.

D-26 Dynamometer

General Electric Co.—A new two-color booklet on G-E Type TLC (cradled), 250-volt, d-c dynamometers for direct connection testing of internal combustion engines, electric motors, pumps, blowers, and compressors, has been announced as available.

D-27 Gage Blocks

Pratt & Whitney Div.—Carbide precision gage blocks are illustrated along with complete specifications in a new pamphlet, 532.

D-28 Impregnant

Archer-Daniels-Midland Co.—Armetol, an impregnant for magnesium alloy, aluminum bronze, and other nonferrous castings is described in Technical Bulletin No. 501.

D-29 Welding Rods

Eutectic Welding Alloys Corp.—A new illustrated leaflet, 443P, contains complete specifications and data on a

(*Turn to page* 104, *please*)

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AIRBRIEFS

By ROBERT McLARREN

SAC Sunk?

All of the air power lessons of World War II are on their way down the political drain, a victim of party politics. This fact is rapidly emerging out of the public testimony of administration party-liners in recent weeks in Washington. Dean Acheson's basic policy of building a balance of power out of military alliances with a vast array of foreign nations is a revolutionary change in this nation's 175-year-old policy dictum of avoiding such things at all costs. As a result of this drift, the need for the Strategic Air Command and its hard-won readiness to retaliate instantly by bombing Russian production centers directly from the U. S. is rapidly disappearing and the controversial Convair B-36 bomber may end up on the scrap heap without ever having played the role its supporters so energetically defended two summers ago.

Under the new Acheson-Truman foreign policy, the assumption is made that the U. S. Air Force will have friendly bases throughout Europe and around the periphery of Russia and these will support the tactical bombers they feel are adequate for the job. This explains, perhaps the Air Force's militant preoccupation with Boeing B-47 and English Electric Canberra jet bomber production in this country, both being medium-light bombers suited for the tactical bombardment job envisioned by Washington's top-level international planners. This means that the "big stick" so many administration leaders have held the Strategic Air Command to be in the past is now not only no longer the single major deterrent to a Russian aerial assault, but that it may not ever see action in its prime role of striking the enemy "anywhere on the globe" from bases in the continental U. S. A.

However, the fight is not over yet and we may see several months of protest by Senators Taft, Wherry and other Republican stalwarts. But, with the Joint Chiefs of Staff in the palms of Acheson and Truman, it seems inevitable that aeronautical science's 10-year battle (at enormous cost) to produce a true intercontinental bomber is now facing the scrap-heap. This means changes of considerable consequences to the character of the aircraft manufacturing industry, changes already evident in the concentration on the short-range bombers previously mentioned, the equipping of these bombers plus all first-line fighters with in-flight refueling equipment and the recent formation of a full wing of tactical bombardment instructors drawn from the Korean war. It appears to us, at least, that somebody has taken his eye way off the ball!

Etymology for Engines

Engineers were just getting used to the broad division of turbojet combustion chambers into "can" type, in which a series of individual, self-contained combustion cans are used, and annular type, in which the whole of the main engine cylinder functions as a combustion chamber, when along comes a combination of the two, first on the Allison J35-A-23 engine and, more recently, on the new General Electric J47-GE-21 engine.

Oddly enough it was not the usually glib public relations specialists who coined the apt term "cannular" for the new type combustion structure, but the engineers themselves. And, just to make the picture a little more confusing, although Allison was the first to publicize the word, it now appears that General Electric engineers had coined the word many months previously.

The combination of the separate features was more a necessity than a refinement when really high airflows were called for in existing design. The whole of the cylindrical space between the compressor and the turbine is used for combustion but into this space is inserted a series of eight individual flame baskets to insure a high degree of turbulence of the incoming compressed air to provide better mixing with the fuel. This eliminates the need for individual cans but preserves the high mass-flow feature of the annular combustor with the better mixing of the individual liners or baskets. The design of such "flame holders" is still more art than science, particularly in the field of afterburners. The idea is to slow down the air as much as possible—done by placing turbulence-producing grids, baskets, etc., in its path—without creating excessively high inertia energy losses.

Each designer uses his pet form of "turbulators" and can produce extensive theoretical and experimental data to prove its superiority. This merger between the can and annular combustion chamber is readily agreeable to engineers, who smugly defy the etymologists to combine the axial and centrifugal compressor forms.

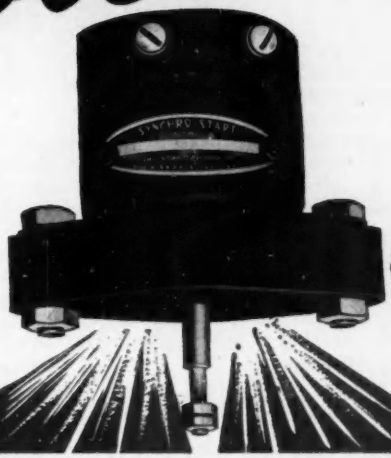
Looming on the horizon, however, is the compound compressor; a series of axial stages followed by a centrifugal stage, which should confuse not only the word-makers but the engineers themselves. Since anyone can play the game we'll get our oar in early for the "axifugal" compressor and be able to say "we told you so" some months hence.

(*Turn to page* 116, *please*)

Continuous Duty

FOR DIRECT CURRENT

Solenoids



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Current Consumption—220 W pulling, 6.5 W holding

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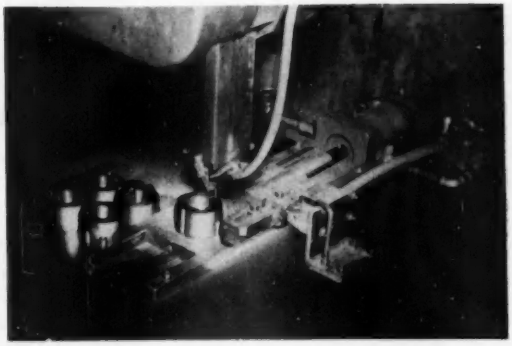
Band Tool Slotting is a Time Saver



By George H. Sheppard
Director of Research, the DoALL Co.

IF a product to be slotted calls for a particular slot width of any size from 0.025 in. to 0.100 in., continuous band type cutting tools and band machines should be considered. This slotting technique gives high output, low tool cost and economical unit production.

The cutting edge length of band tools ranges from 120 in. to 238 in., depending on the size of band machine employed. The comparatively great length of these bands enables uninterrupted production, eliminates maintenance cost and results in low unit production cost.

For example, when slotting collets and collars, or products such as masonry drills for carbide inserts, parts can be fed into the band tool virtually automatically through the use of air cylinders or hydraulic feed and proper fixturing. This eliminates much of the set-up time which usually accompanies conventional type operation.

There are several different types of band tools, each having its own characteristics for cutting certain materials and for providing various slot sizes. To determine the size of slot a standard raker set band tool will cut, it is necessary to start with the known set

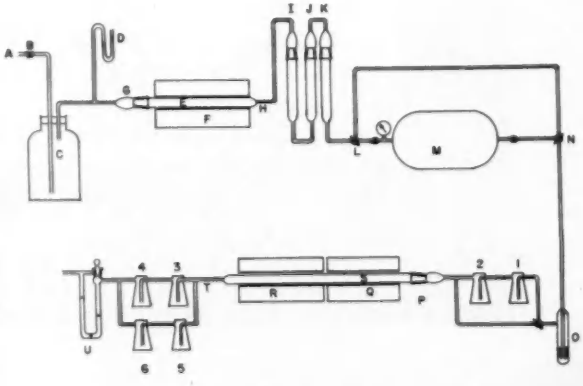
(*Turn to page* 132, *please*)

New Method for Analysis of Jet Engine Exhaust Gas

ACCURATE data on the efficiency of the combustion process in jet engines is provided by a gravimetric method of exhaust-gas analysis recently developed by the National Bureau of Standards. As the NBS procedure also supplies information on the nature of the components of the exhaust gas, it is expected to prove useful in the design and development of new types of combustion chambers for gas turbines and jet engines.

Fuel burned in jet combustion chambers releases energy which is converted either to thrust, to shaft horsepower, or to both, depending on the type of installation. The efficiency of the combus-

(*Turn to page* 118, *please*)



Schematic diagram of the apparatus used by the National Bureau of Standards in its new gravimetric method for analysis of jet-engine exhaust gas. A sample of exhaust gas from the 16-liter stainless-steel sample container M enters the analysis section of the apparatus through the three-way stopcock N. It then passes through the cold trap O to absorption bottles 1 containing drierite and phosphorus pentoxide, separated by asbestos and 2 containing ascarite and phosphorus pentoxide, separated by asbestos. The portion of the sample that is not absorbed or condensed enters the combustion tube S, which is surrounded by electric heaters Q and R. Water and carbon dioxide produced by burning these gases in the combustion tube are absorbed in bottles 3, 4, 5 and 6. Bottles 3 and 5 contain anhydrone and phosphorus pentoxide, separated by asbestos; bottles 4 and 6 contain ascarite and phosphorus pentoxide, separated by asbestos. Dry, carbon-dioxide-free air for flushing the cold trap is supplied by the apparatus at upper left, which consists of a source of compressed air (at A), a control valve (B), a jar of activated alumina (C), a mercury manometer (D), a quartz combustion tube (E) containing copper oxide wire, an electric heater (F), and a series of absorption tubes (I, J, K). Rate of gas flow is determined by the flow meter U.

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and 128 Acre Peoria Plant

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World's largest makers of Diesel road-building equipment

MOVES, LIFTS AND STACKS MATERIALS WITH YALE!

PRODUCTION is rolling at a record pace here in "Caterpillar's" Peoria and new Joliet plants—but "Caterpillar" quality stays as high as ever.

It's a staggering job putting these big "Cat" products together on a volume basis—one that requires tremendous tonnages of materials to be stored and moved through these vast plants every day.

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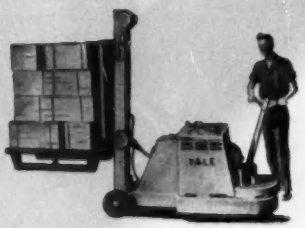

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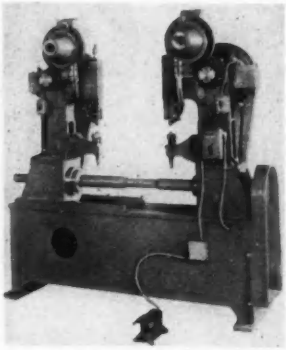
E-10—Dual Riveting Machine

Designed to save time and labor in assembly and riveting, a new "Dual Rivitor" has been furnished to Allis-Chalmers Mfg. Co. by the Tomkins-Johnson Co., Jackson, Mich. The Rivitor is equipped with 10 in. hoppers, and tooled to automatically feed and set two ¼ in. diam. by ⅝ in. long wagon box head rivets at a time in elevator chain and raddle assemblies for farm implements.

The machine consists of two 8 in. model R Rivitors, mounted face to face



Tomkins-Johnson Dual Rivitor, Model R.

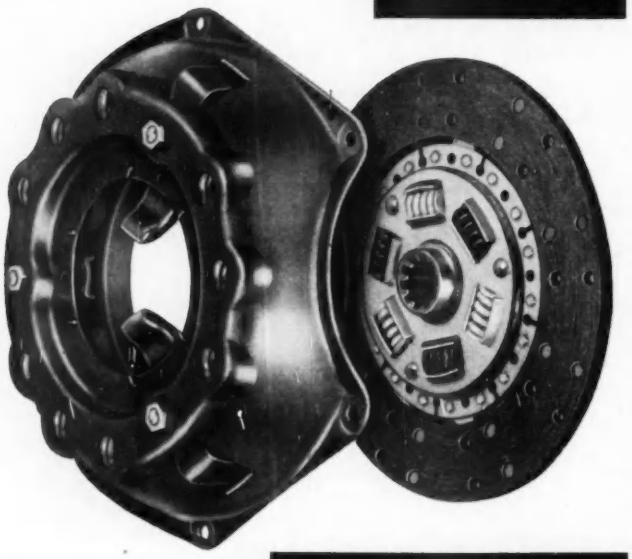
on a common base, adjustable for rivet spacings ranging from 2½ in. to 18 in. center to center. One motor drives both flywheels, which are synchronized by a combination gear and chain drive arrangement. Both clutches are tripped by solenoids, connected to a single foot switch.

E-11—Straight Line Automatic Loader

A straight line automatic loader developed by National Broach & Machine Co., Detroit, Mich., permits shaving all gears of a two, three or four step cluster continuously and automatically, by a battery of Red Ring Diagonal shaving machines set side by side in line. The side-by-side rather than front-to-back arrangement permits full view of the complete operation for the operator and set-up man. A single operator is needed merely to supply unshaved gears to the magazine feed of the first machine, and to remove the completed gears from the discharge chute of the final machine. All handling between machines is done by automatic mechanical transfer mechanisms. Each cutting cycle is automatic.

The individual shaving machines in

Engineered by Borg & Beck... means MAXIMUM PERFORMANCE MINIMUM MAINTENANCE!



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VICKERS multiple unit valves for the best hydraulic control of mobile equipment

NEW!

Vickers Multiple Unit Valves provide every desirable feature of custom design at production-line prices. Vickers sectionalized construction permits you to specify the exact control functions needed and no others; yet you pay no special design or production costs.

To meet various control needs (original specification or conversion) and to make many combinations without unwieldy inventory . . . use the Vickers sectionalized valve assembly.

To control motion positively and accurately . . . you get Vickers exclusive load inching control (also makes it nearly impossible to jar or dump a load unintentionally).

To obtain any type and size of valve unit . . . Vickers provides 11 types of valve sections in four pipe sizes.

To hold load position while operating other machine components or while pump drive is stopped . . . Vickers has the back flow prevention check valve.

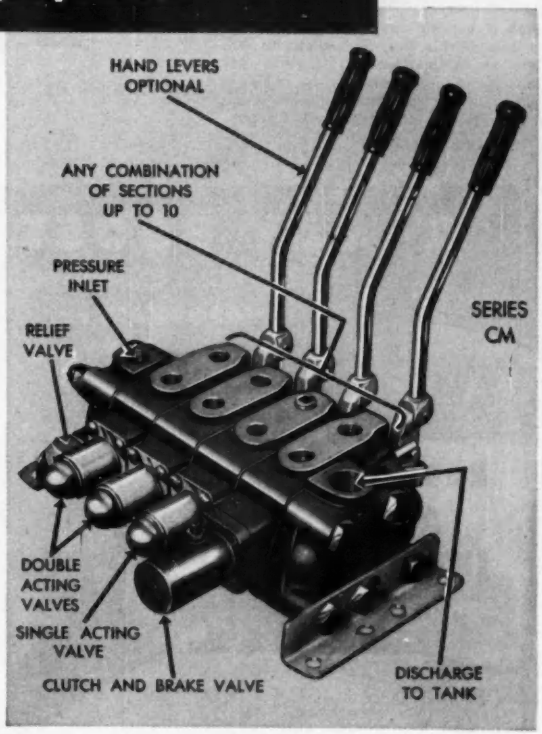
To prevent overload and damage to machinery . . . the assembly includes a Vickers positive-acting factory preset relief valve.

To assure a leak-proof, drip-proof system . . . Vickers nested "O" ring seals between valve sections and on valve plungers.

To make valve operation complete . . . Vickers furnishes spring loaded valve plungers (rugged operating levers optional).

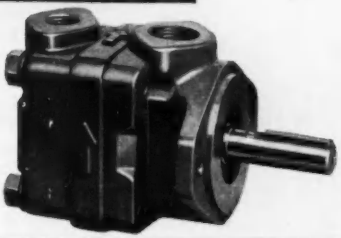
To get full capacity for piping or tubing size . . . Vickers rates valves conservatively at 18 gpm for the ½" size up to 48 gpm for 1".

To obtain the utmost in performance and dependability . . . use a 100% Vickers hydraulic system including Vickers Vane Type Pumps. (See below.)



VICKERS balanced vane pumps for mobile equipment

These pumps are tough and long-wearing. Hydraulically balanced construction eliminates pressure-induced bearing loads. Automatic wear compensation maintains correct radial and axial running clearances throughout pump life . . . efficiency and delivery rate remains high. Series V-200, V-300 and V-400 range in capacity from 2 to 73 gpm. Operating pressures up to 1500 psi. Available also as double pump. Get full details from the Vickers Application office near you, or write for Catalog M-5100.



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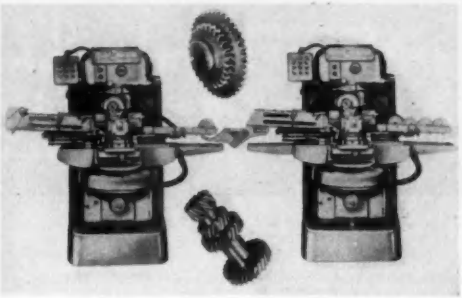
such a battery are arranged so that no appreciable time is lost due to differences in machine cutting time. Although all machines for a multiple operation are synchronized, each is individually controlled and may be operated individually.



National Broach & Machine Co. Red Ring straight line automatic loader.

This new simplified loader incorporates a loading magazine having gravity feed, an intermediate feeder slide and an incline discharge chute. At completion of a cutting cycle of the first machine which is set up to shave the first gear of a cluster, the cutter stops, the pneumatically actuated tailstock retracts to strip the shaved gear and place it on the unloading finger of the feeder slide. As the feeder slide advances it deposits the shaved gear in the discharge chute and simultaneously brings an unshaved gear from the magazine into mesh with the cutter. Immediately the tailstock advances to engage the new gear, cutter rotation begins and the feeder slide returns to its initial position ready for the next cycle.

The gear deposited in the discharge chute of this first machine is engaged by the fingers of the automatic intermachine transfer mechanism and deposited in the magazine of the next machine in line, which is set up to shave the second gear of the cluster. Thus, the gear is passed from one machine to the next until all gears of the cluster have been shaved.

The unloading chute of the last machine stores the completed gears until they can be removed by the operator. If this is not done, and the chute becomes completely filled, the shaving machine stops automatically until the chute is cleared.

An automatic gage at the entrance to the feed magazine of the first machine in line prevents the accidental inclusion of any oversize gears which might damage the shaving cutters.

E-12—Boring and Turning Mills

A combination of important design improvements is incorporated in all new Hypro vertical boring and turning mills, according to the Giddings & Lewis Machine Tool Co., Fond du Lac, Wisc.

These built-in structural features include: non-metallic bearings for ram and saddle; independent traverse motors for rail and side heads; swivel type pendant control; helical rack and pinion

(*Turn to page 67, please*)

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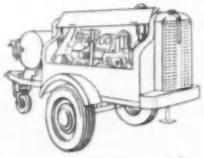
Portable air compressors must work hour after hour under constant load — in spite of stifling summer heat. That's why leading manufacturers of these units choose Yates-American Radiators for the important task of cooling both the hard-working engines and the air they compress.



Yates-American radiators are specially designed for each application. By working in close cooperation with manufacturers' engineers, Yates-American pioneered the development of satisfactory intercoolers for the air compressor industry.

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Yates-American makes quality radiators for motor trucks, industrial trucks, tractors, locomotives, power plants—offers products for every heat transfer use. Give us your requirements . . . we'll show you how we can help you.

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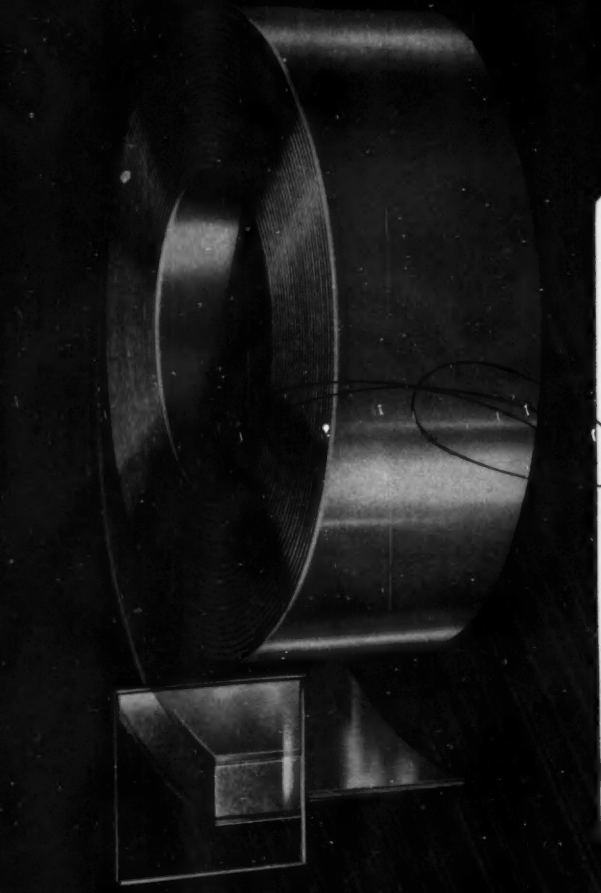
HEAT TRANSFER PRODUCTS DIVISION • BELOIT, WIS., CHICAGO, ILL.

Using **copper** in your product?



where you need only the

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If you don't use the "inside" of the gauge thickness in your copper strip applications, have the core of plain steel—and save money as you save essential copper for defense! With SuVeneer Clad Metals, you get the dense, solid surface of copper, bonded inseparably to low carbon strip steel on one or both sides. You get the performance you need, at lower cost. ● *Write for the detailed facts.*

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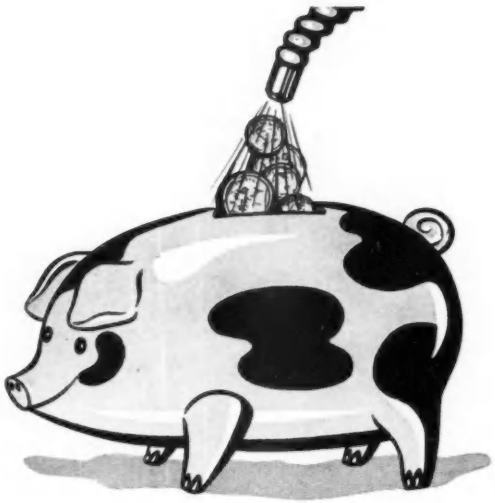

Neat trick for cutting oil!

You'll realize how Houghton Antisep puts "money in the bank" as soon as you start using it. Your machinists mix as much as 30 parts of plain water to one part of this all-purpose base. It will cover better than 90% of your metal-cutting jobs.

Use Antisep for general machine work . . . for automatics . . . for stamping and forming. You handle *one* instead of many cutting oils. You save space, write smaller inventories, simplify selection!

Throughout industry users are reporting good examples of Antisep's cost-cutting benefits . . .

A midwest metalworking plant reduced cutting fluid costs from 35¢ to 7½¢ per gallon . . . a well-known N.Y. manufacturer is cutting coolant costs 75% . . . a Pennsylvania plant operator reports better results at less than 1/3 of their previous oil costs . . . to mention just a few of many actual cases.

Why don't you ask the Houghton man to arrange a convincing test on your tough machining operations? Or if you prefer further information in advance, write to E. F. Houghton & Co., Philadelphia 33, Pa.

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HIGH IN ANTIWELDING PROPERTIES AND FATTY CONTENT

LATEST BULLETIN
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E. F. HOUGHTON & CO.
PHILADELPHIA · CHICAGO · DETROIT · SAN FRANCISCO

Ready to give you on-the-job service . . .

NEW PRODUCTION AND PLANT EQUIPMENT

For additional information please use coupon on page 56

(*Continued from page 64*)

on the ram; clearly marked feed controls; anti-friction bearing table transmission; new 16 feed gear box; table anti-friction thrust and load bearings; two arrangements of mechanical change gear drives; and three electrical arrangements for single shift drives.

Non-metallic ram and saddle bearings are resistant to the abrasive action of metal dust, forging scale and sand from improperly cleaned castings, and are unaffected by transfer and residual heat that often distorts solid metal bearings, the company points out.

Individual motors for rail and side heads respond instantaneously to machine controls, since complicated drive shafts and transmission units have been eliminated, the company emphasizes.

The pendant control swivels for easy machine operation. On single shift drive machines, remote table speed control, included.

The new type helical rack and pinion assures smooth ram feed when threading or drum scoring. Fine adjustment is by hand cranks on 54 in. and 64 in. machines and through sliding fine adjustment handles on feed shafts and rail screws on larger machines.

Anti-friction radial and trust bearings are used on all shafts to insure transmittal of maximum available hp to the tool point. Gears run quietly in a constant spray of filtered oil. Power from the motor is supplied to the transmission through multiple V-belts.

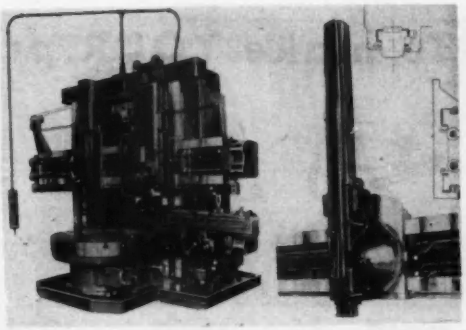
The new feed box provides 16 feeds from 0.003 in. to 0.500 in. and 54 in. and 64 in. machines, and feeds from 0.004 in. to 0.750 in. on 6-ft or larger machines. The feed box is accessible for rapid gear change-over.

Use of a large, anti-friction taper roller bearing to offset table radial thrust, and a heavy-duty roller bearing track to support table and load, is said to mark a progressive departure in conventional machine design. It becomes possible to operate vertical boring and turning mills at highly increased speeds, as well as practical to use carbide tools—especially in turning small diam work.

Mechanical change gear drives are available for any of the new Hypro machines in two arrangements. In the 16-gear change main drive, table speed variation is obtained through 16 mechanical gear changes. Power for this drive is obtained through a 1200 rpm 40, 50 or 60 hp ac motor.

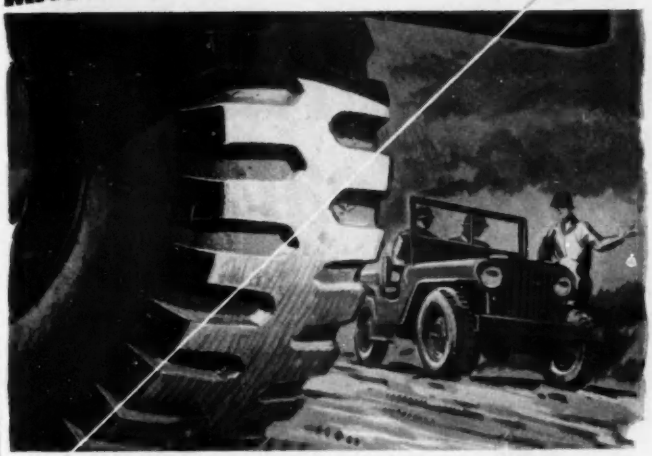
A similar mechanical main drive, but having 4 gear change, requires a 40 or 50 hp adjustable 3 to 1 speed dc motor for table speed variation.

(*Turn to page 68, please*)



Giddings & Lewis Hypro vertical boring and turning mill. At right: helical rack and pinion on the ram, designed to assure smooth even feed

MAGNECORD *Sound Research*®



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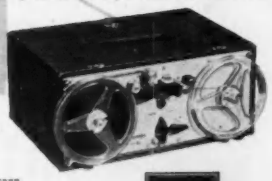
Tough mud-slogging tires roll our forces toward the front. Behind rugged-duty tires lie months of sound research with Magnecord tape recorders . . . vibration tests to determine the wear and performance of new tires in development. Precision testing demands the finest precision tape recording. Whatever your recording problem, Magnecorders offer greater flexibility, fidelity, features. Available for subsonic, audio or supersonic research, Magnecord can fill your most exacting requirements.

Used by more engineers than all other professional tape recorders combined.



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DESPITE all the care you lavish on the design and construction of your product, its successful performance may ultimately depend on a few, relatively small, gears. That's why it makes good sense to use only gears of *established quality*. FAIRFIELD GEARS have proved themselves "in use" on an almost limitless range of industrial products during the past 30 years. They are made-to-order—any type, and in a wide variety of sizes—to meet your special needs.

On your next gear problem, call in FAIRFIELD at the start. FAIRFIELD engineers are qualified to make expert recommendations that may save you time, money and future concern about gear performance in your product. Write for interesting, illustrated brochure.

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319 S. Earl Ave. Lafayette, Indiana

NEW PRODUCTION AND PLANT EQUIPMENT

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(*Continued from page 67*)

The single shift drive provides three different electrical arrangements. With the 3 to 1 heavy-duty adjustable voltage drive, table speeds from 20 to 1 in two separate ranges are possible. The 6 to 1 extra heavy-duty adjustable speed drive also has infinitely variable table speeds from 20 to 1 in two separate ranges. The third arrangement is the 6 to 1 adjustable speed direct current drive.

E-13—Saddle Type Turret Lathe

Design changes in a new model 4A heavy duty saddle type turret lathe placed on the market by the Warner & Swasey Co., Cleveland, Ohio, include a new hydraulically actuated forward and reverse clutch in combination with a disk-type hydraulic brake incorporated in the headstock. This provides faster, smoother, shockless handling of the 8-12 in. bars accommodated by this size machine. Clutch and brake machanism is controlled by a "forward-reverse-brake" lever which eliminates the neutral or intermediate delay position previously used. The new design permits fast starts, stops and reversals of heavily weighted spindles.

The rapid traverse shaft has been moved to the front of the machine, and rapid traverse is now provided to the cross slide, with a single lever to control rapid traverse motion in four directions.

Power for the rapid traverse drive—formerly by belt take-off from the main drive shaft—is now supplied by a separate 3 hp motor mounted in back of the headstock. This same auxiliary motor also drives the coolant, hydraulic, and lubricating pumps. The effect of a separate power source for these auxiliary functions is to permit the utmost flexibility in the selection and application of the main drive motor.

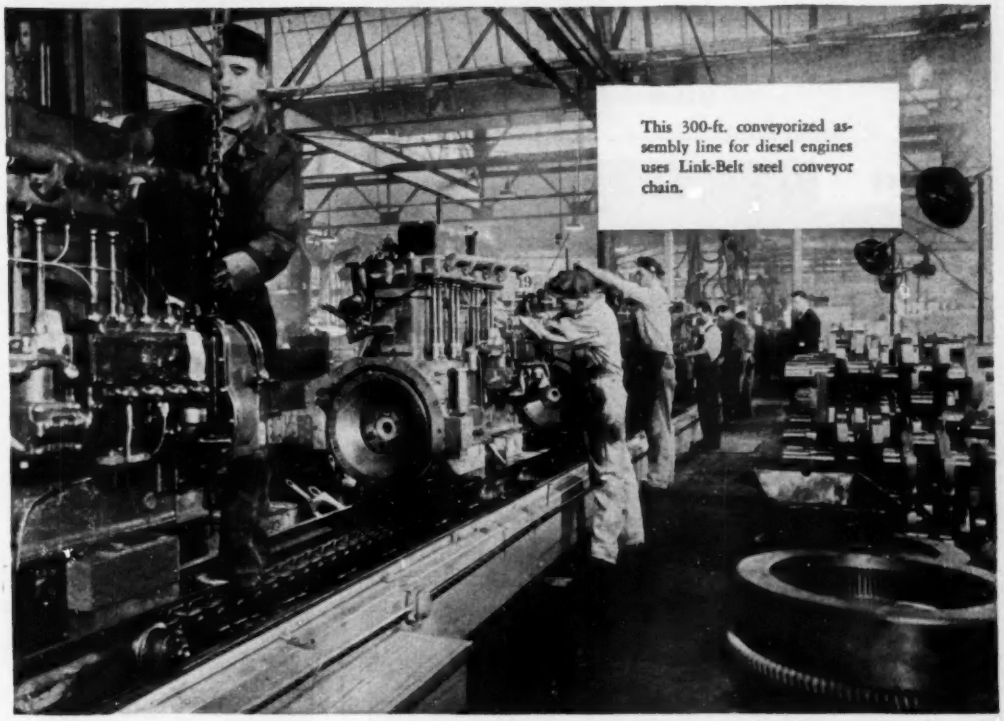
Pressure in the lubricating system has been increased, and a new-type high pressure gear pump has been applied to the unit. The hexagon turret stop roll design has also been improved for easier adjustment and long life. All electrical controls are now consolidated in a single control box, simplifying protection and maintenance.

Bar feed attachment is now hydraulically operated, utilizing the same stand and feed head as previously used in the manually operated model, but substituting effortless hydraulic actuation through a control lever mounted atop the carriage stop rod bracket.

(*Turn to page 70, please*)

No ONE chain serves every purpose

LINK-BELT makes all types of chains



This 300-ft. conveyorized assembly line for diesel engines uses Link-Belt steel conveyor chain.

...recommends the right one for your job

Typical chains from the complete Link-Belt line

Class H Pintle chain—excellent for conveyors that slide, used plain or with attachments.

Class C combination chain—popular, durable, low cost design for elevators, conveyors.

Class SS bushed roller chain with offset sidebars—for heavy drive service at moderate speeds.

Link-Belt "Flint-Rim" cast sprockets, give extra long life. Cast steel sprockets are also available for most severe service.

More than strength—more than length—all operating qualities are taken into consideration by Link-Belt engineers when they recommend a chain for your job. From the world's most complete line of chains, they can select the *right type* to meet your specific requirements—large or small. Link-Belt builds them all. And all are built to the highest standards. Exact control of materials and manufacturing processes is your assurance of longer chain life. 12,327-D

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities.

LINK-BELT

CHAINS AND SPROCKETS

NEW PRODUCTION AND PLANT EQUIPMENT

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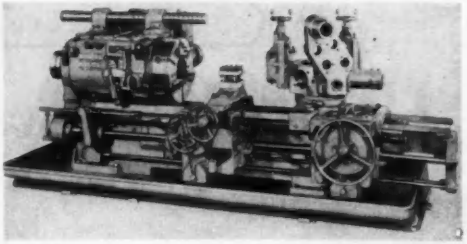
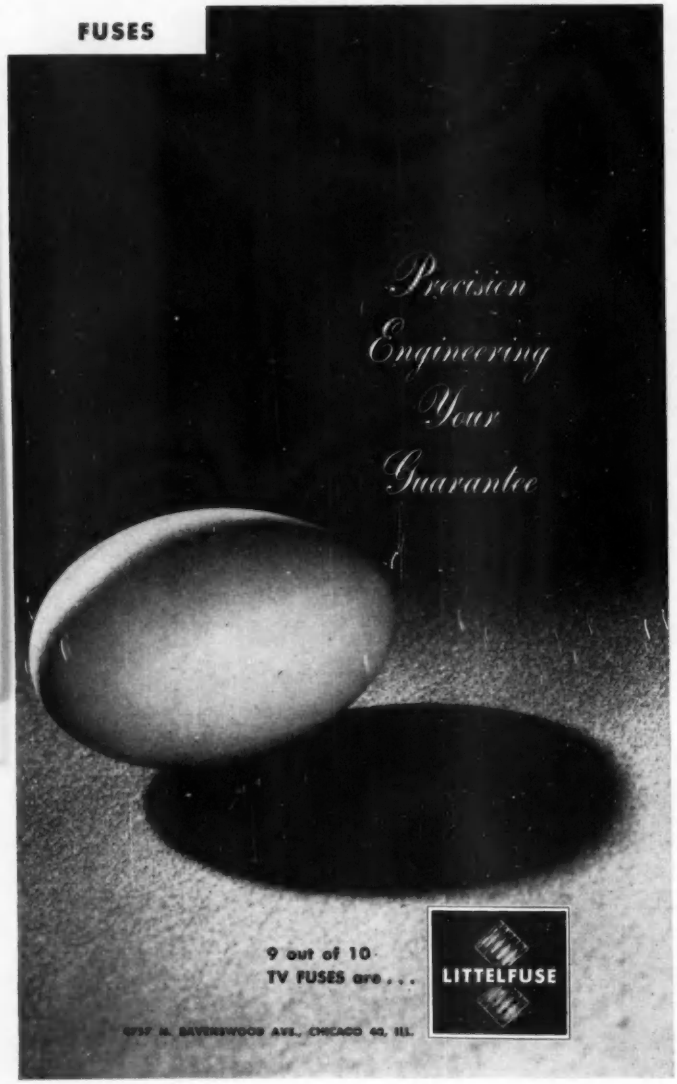
(*Continued from page 68*)

The power chuck wrench control lever has been replaced by a more efficient pistol grip arrangement, using a trigger interlock release for easier manipulation.



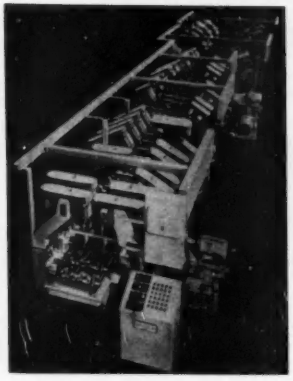
Warner & Swasey heavy duty saddle type turret lathe, Model 4A.

All standard tools will continue to be applicable to the new model, and in addition, the heavy duty stationary overhead pilot bar will now be available for the 4A-1550 (12 in. bar capacity) machine.



E-14—Transfer Machine for Processing Crankshafts

Featuring auto-sequencing control, a new 43-station, automatic transfer machine, designed and built by Snyder Tool & Engineering Co., Detroit, Mich., drills all oil passages and lightening holes in cast iron alloy crankshafts. Designed to eliminate much handling and maintain a high rate of production, the machine has a production capacity of 74 pieces an hr at 100 per cent efficiency,



Snyder 43-station automatic transfer machine for processing cast iron alloy crankshafts.

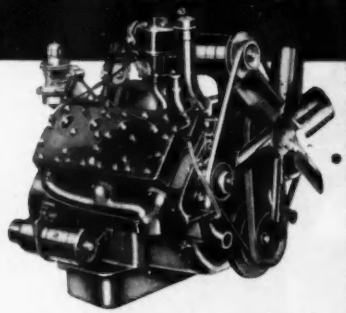
or 52 pieces an hr at 70 per cent efficiency.

Crankshafts are automatically positioned and clamped hydraulically prior to drilling at each station. Indexing throughout the work cycle is accomplished automatically by a hydraulic transfer-type unit which provides rapid and smooth indexing. Holes are then blown out and automatically inspected at the last station.

High speed steel tools revolve at 40 fpm. with a feed of 0.008 per revolution on lightening holes and controlled feed on oil passages. Easily accessible, the tools can be changed quickly. Drills for

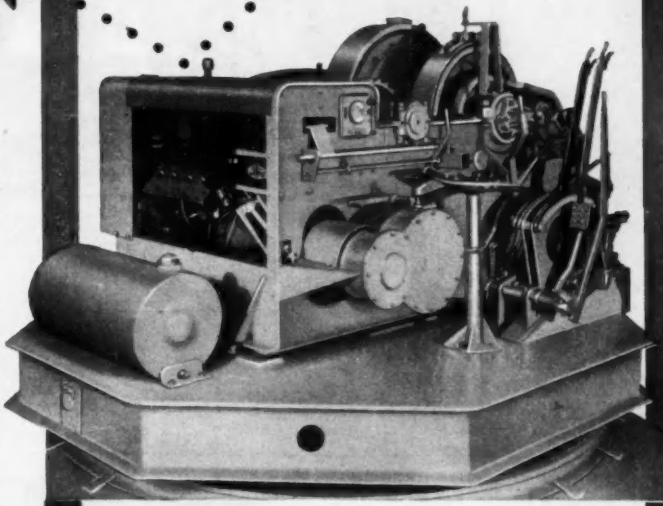
(*Turn to page 74, please*)

Power for Profits...with FORD POWER!



Illustrating one of the many specialized design applications of Ford Power is the Berger Loader, made by the Berger Engineering Co. and using the Ford "337" V-8 Industrial Engine, chosen because it is "universally recognized for efficiency, economy and long life."

YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED



● When you standardize on Ford Power for your equipment you are assured of the **RIGHT** Power, with the **RIGHT** Features and the **RIGHT** Service—the **RIGHT** combination for more sales, more profits.

Ford Industrial Engines and Power Units are available in five great models from 120 to 337 cu. in. displacement . . . a four, two sixes and two V-type eight-cylinder engines. Every unit is individually tested and ready to run.

Right Features, too—with Ford Industrial Engines and Power Units you have available a complete line of special Ford equipment and accessories to meet specific operating requirements.

What's more, Ford Power assures you of *Right Service* . . . as near as the nearest Ford Dealer. Result—such important operating advantages as replacement parts availability, reducing parts inventory costs . . . ease of servicing, minimizing costly "down time."

For equipment powered for profits, specify Ford Industrial Engines and Power Units.

Here are some typical Ford-powered defense applications:

Pumps . . . Loaders . . . Lift Trucks . . . Fire Engines . . . Standby Power Units . . . Welders Power Shovels . . . and many others.

INDUSTRIAL ENGINE DEPARTMENT
Tractor & Industrial Engine Division
FORD MOTOR COMPANY
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Our experienced Sales Engineers are at your service in developing engineering recommendations for the most efficient use of Ford Industrial Power in your application.

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I am interested in Industrial Power for:_____
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Send me new 1951 literature on Ford Industrial Power (cu. in. dipl. and cylinders as shown).
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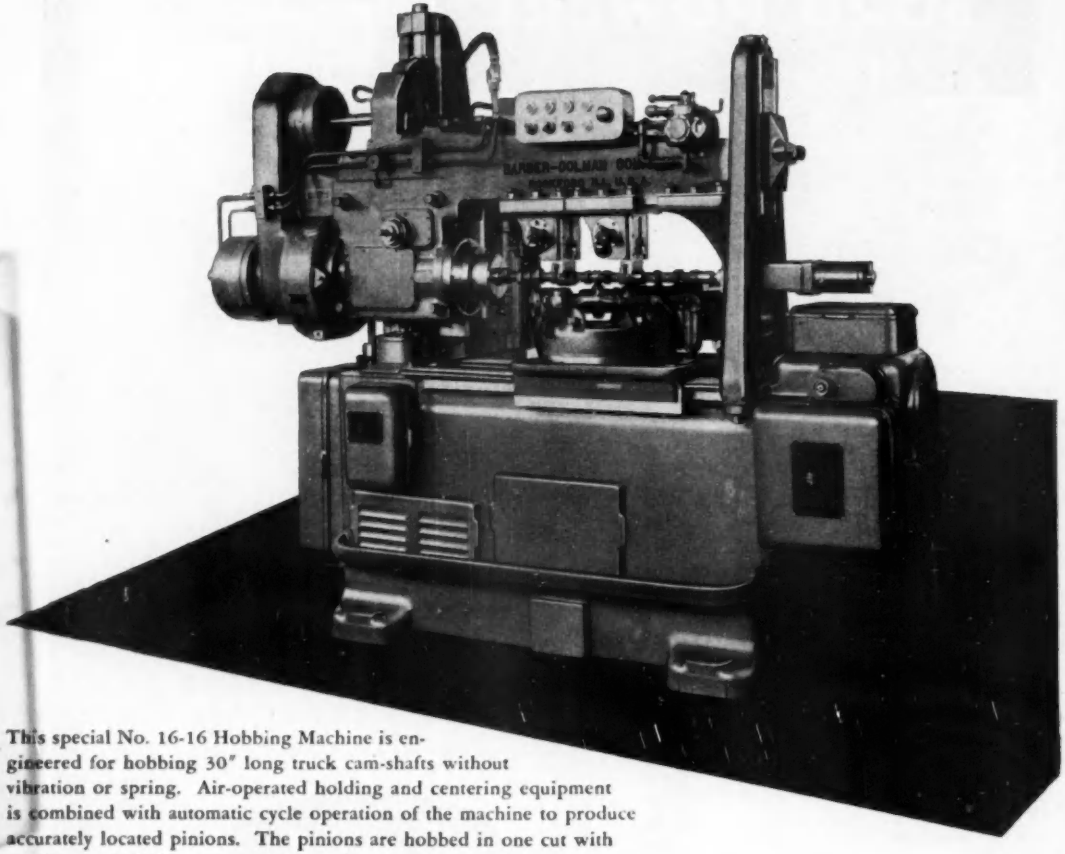
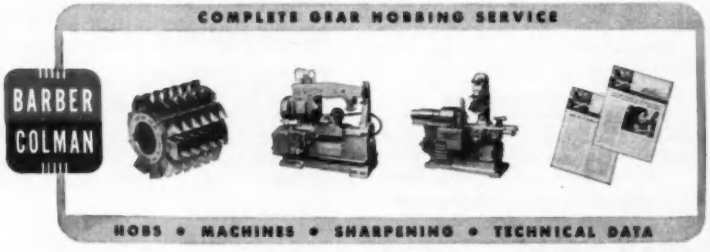
Barber-Colman

No. 16–16 HOBBING MACHINES

HOB LONG CAM-SHAFTS ACCURATELY — 41 PER HOUR

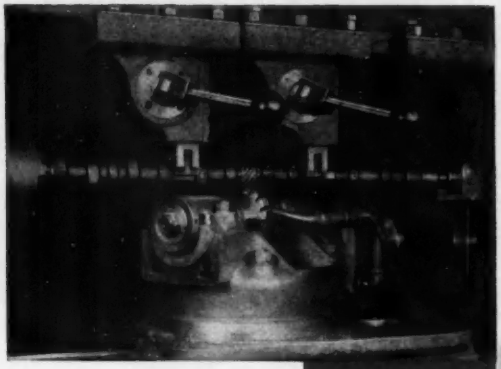


This special No. 16-16 Hobbing Machine is engineered for hobbing 30" long truck cam-shafts without vibration or spring. Air-operated holding and centering equipment is combined with automatic cycle operation of the machine to produce accurately located pinions. The pinions are hobbed in one cut with maximum pitch line concentricity at the rate of 41 per hour.



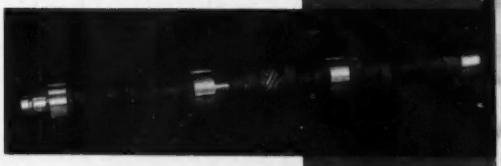
BUILDERS OF PRECISION GEAR

ONE-CUT FINISH HOB PINIONS TO .002" P. D. RUNOUT. AUTOMATIC CYCLE PRODUCES 41 SHAFTS PER HOUR



Quick loading is accomplished by air control. One end of the shaft is held in the air operated collet, and the other end is supported in the cradle at the bottom of the front center bracket. When the Air Control Valve is energized the shaft is centered, properly located and seated against a stop in the collet. Delayed action closes the collet after seating and locating have been accomplished. Manual or air operated steadyrests prevent any bend or vibration in the shaft due to the action of the hob. Tool life is approximately 175 pieces per sharpening.

When the operator presses the "Start" button, the automatic hobbing cycle engages the vertical cam feed which lowers the work onto the hob. Only plunge feed is used — no horizontal feed. After the hob has reached full depth, the work slide raises automatically to its starting position, and the machine is stopped. A pressure control safety device protects the operator in the event of a casualty in the air pressure system.



This cam-shaft pinion requires precision accuracy for proper operation of the truck motor. Barber-Colman No. 16-16 Hobbing Machines successfully combine this essential accuracy with operator convenience and high output. They do this requiring the least amount of man-motion and effort.

That's where Barber-Colman Hobbing can help you with your "special" gear problems. Let the machine and equipment handle the job requirements. Then the operator has only to load and unload, thereby obtaining maximum production for your capital investment.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 187 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

HOBS AND MACHINES SINCE 1911

▼ **STUART'S THREDKUT 99 MORE THAN DOUBLES TOOL LIFE PER GRIND.** In threading type 310 stainless male pipe union sections on large automatics, a Milwaukee plant was getting 136 pieces per tool grind. A change to Stuart's ThredKut 99 increased this to 310 pieces per grind —and the cost was 3c less per gallon for oil.

▼ **FORM TOOL LIFE INCREASED 36% WITH STUART'S SPEEDKUT B**—on 6 spindle automatics forming and threading cut-off cap screws of SAE 1060, 10-17 Rockwell C.

▼ **4 TO 1 LESS MACHINING DOWNTIME WITH SPEEDKUT B.** After changing to this Stuart product on an automatic turning out worm gear blanks, the customer reports, ". . . machine now made available to more production within its capacity."

ARE YOU really getting the capacity that was built into your automatic screw machines? In shop after shop, Stuart oils correctly applied have upped production substantially and, as a by-product, have usually improved quality and increased tool life.

It is worth finding out what a Stuart Representative can accomplish for you. Ask to have him call and SEND FOR EDUCATIONAL LITERATURE on cutting fluids for screw machines.

D. A. Stuart Oil Co.
EST. 1865 LIMITED

2733 S. Troy St., Chicago 23, Ill.

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(*Continued from page 70*)

oil holes are mounted in keyless, hand-operated chucks. Stroke is 16 in. station to station. Standard Snyder guide bar units and Leland-Gifford deep hole units are used. For safety, an emergency cord runs the full length of the machine to stop the index and return all units rapidly.

Lubrication is motor driven and fully automatic. Coolant supply is from a central system in the building. Floor space required is 12 ft by 60 ft. Base and column construction is rigidly braced, welded steel, thoroughly normalized.

E-15—High Speed-Sensitive Tapping Machine

A high speed-sensitive tapping machine operated by foot or air pressure, announced by the Ettco Tool Co., Inc., Brooklyn, N. Y., uses either single spindle tapping units or multiple heads, with provision for quick changeover from one production job to another.

No skill or delicate touch is required, tapping action being controlled through an adjustable pull spring inside the centerless ground column. Whenever the foot treadle is pressed down by foot or air, this spring feeds the tap into the work and gives automatic protection against tap breakage or faulty threads.

Two oil tanks are built into the machine; one cast-in-head using gravity

Ettco-Emrick tapping machine, No. 72A.

Another PESCO FIRST...the Unloading Gear Pump ...flies with SAAB at transonic speeds

Lighter weight . . . longer service life . . . lower maintenance expense . . . smaller initial cost . . . four good reasons why Pesco's new unloading gear-type hydraulic pump is rapidly replacing conventional variable volume pumps on aircraft . . . particularly jets.

Among the first to take advantage of the many benefits of Pesco's latest contribution to more efficient, more dependable aircraft operation is the famous Swedish SAAB Aircraft Company. Its new SAAB-29, designed to fly at speeds up to the transonic speed range, depends on the Pesco Unloading Gear Pump for all hydraulic operations including landing gear, wing flap, brake operation, etc.

Always alert to the demands of aircraft makers for reductions in weight, elimination of service and maintenance problems, and lower costs, Pesco research engineers are continually searching for ways to improve present equipment as well as develop new products to meet these important requirements.

It is this constant research that keeps Pesco aviation products standard equipment on military and commercial aircraft. If you have a problem in aircraft hydraulics or fuel handling, perhaps this experience can help you. A Pesco engineer will gladly discuss your problem with you . . . without obligation, of course.

Pesco Model 011799 Unloading Gear Pump. Weight 8.6 lbs. Maximum continuous operating pressure 1500 p.s.i. Capacity 2 g.p.m. at 1500 r.p.m. Features Pesco's exclusive, patented "Pressure Loading" principle. Other models available for pressures to 3000 p.s.i.

engineering Pesco production

PRODUCTS DIVISION

BORG-WARNER CORPORATION

24700 NORTH MILES ROAD BEDFORD, OHIO

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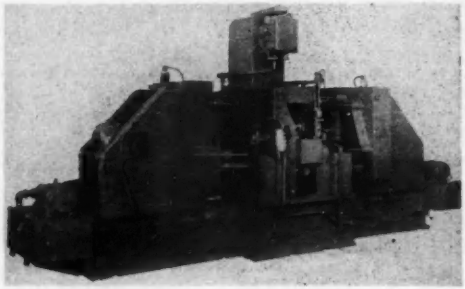
feed for light lubrication, the other in-base for use with oil pump when steady flow of oil is required.

A built-in stripper plate permits use of simple work holders and is used to strip the part from the tap. It also holds lubrication tube and brush.

LeMaire three-way 20-spindle hydraulic feed drilling machine



E-16—Hydraulic Feed Drilling Machine

Built by LeMaire Tool & Mfg. Co. of Dearborn, Mich. is a three-way 20-spindle hydraulic feed drilling machine for processing automotive transmission counter gears. The machine drills the main 15/16 in. center hole from the solid steel forging in seven steps, and finishes each end with spotface, counterbore and groove. It also drills two 11/32 in. holes through the web at one end of the gear and a 5/16 in. hole across the gear hub.

This machine consists of a fabricated steel center base which carries a trunnion support with a No. 200 twin ram vertical single spindle unit, having No. 30 HS horizontal right hand and left hand units. The right hand unit has a 9-spindle head and the left hand unit has a 10-spindle head. The No. 30 HS units have hardened and ground steel ways with a distance of 30 in. across the ways. The 10-position trunnion is hydraulically operated for automatic indexing and carries 10 work holding fixtures which are clamped and unclamped with a hydraulic torque wrench.

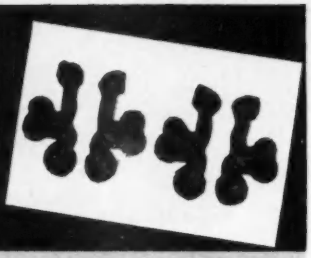
Production is approximately 100 pieces per hr at 100 per cent efficiency.

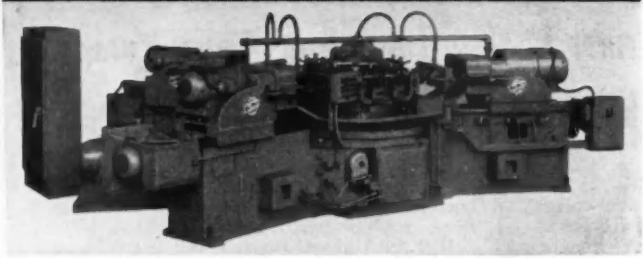
Laboratories to Get Mat'ls Priorities

Technical and scientific laboratories are to be given priority aid in obtaining controlled materials in order to carry on "important" research projects. These programs have been getting spot assistance because often there is no way to tell exactly how much steel, copper, or aluminum they may need during a given quarter. Now, however, under a recent order (M-71), such laboratories may self-certify orders with a new symbol (X-1) to obtain the following quarterly amounts of materials: carbon steel, five tons; stainless steel, 300 pounds; other alloy steel, 500 pounds; copper, copper base alloy, brass mill and copper wire mill products, copper and copper base alloy foundry products and powder, 500 pounds; and aluminum, 500 pounds.

Drilling and Reaming

388 KING PIN HOLES PER HOUR





Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

Free Data

Will be furnished on request.

DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

You're always right with

AUTO-LITE

AUTO-LITE serves the nation's needs . . . with more than 400 products used as original factory equipment on many leading makes of America's finest cars, trucks and tractors. By building products of the highest quality and dependability . . . Auto-Lite has grown to be the world's largest independent manufacturer of automotive electrical equipment . . . and the best advertised name in the automotive after market. Today's buyers of cars and trucks know "You're Always Right With Auto-Lite."

THE ELECTRIC AUTO-LITE COMPANY
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WORLD'S LARGEST INDEPENDENT MANUFACTURER OF AUTOMOTIVE ELECTRICAL EQUIPMENT

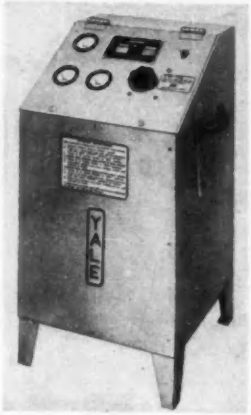
NEW PRODUCTS

FOR ADDITIONAL INFORMATION regarding any of these items, please use coupon on PAGE 56

F-13—Industrial Truck Battery Charger

From the Phila. Div. of Yale & Towne Mfg. Co., Phila., Pa., comes news of a new industrial battery charger for units up to 55 amp-hr capacity. Operated on the selenium rectifier principle, the new charger is designed to give simplified maintenance-free operation, prolong battery life, and save power. These results are accomplished primarily by an automatic controller which governs the amount and time of charge, and a complete lack of moving parts.

Reducing the human element to a minimum, the charger presents only three simple steps to perform—plug the charger in—set clocks—and throw a switch. There are no moving parts to maintain. An extra large plate area obviates need for a fan. There are no commutators or brushes to be lubricated or create friction.



Yale & Towne battery charger for industrial trucks.

A dual clock control affords identical protection to both new and old batteries, whether fully or partially charged either in a cold or warm area. To accomplish this, temperature compensation is built into the charger.

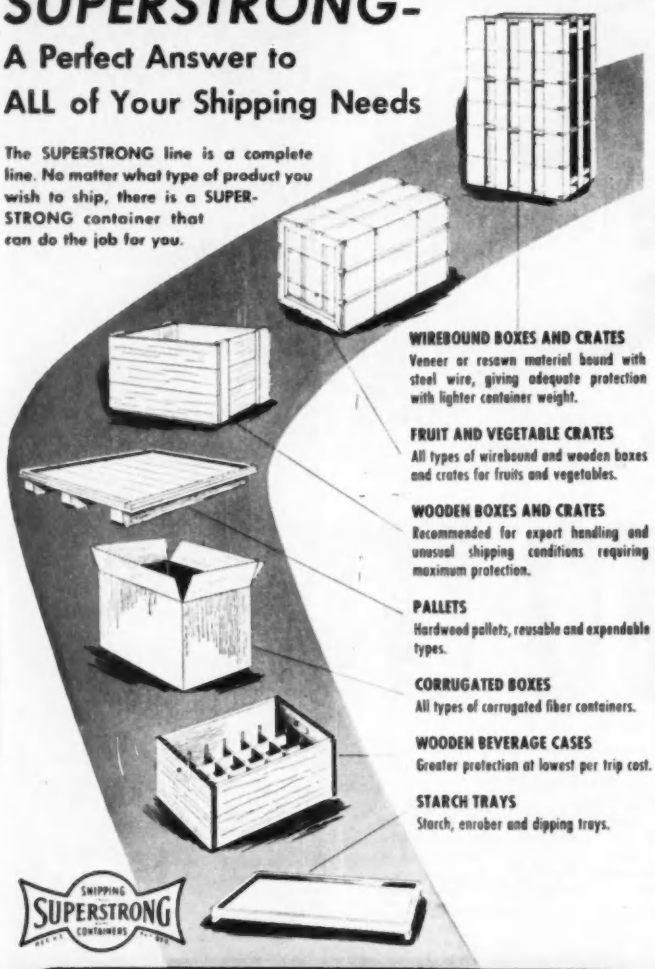
F-14—Air-Fuel Ratio Controller

An air-fuel ratio controller placed on the market by Leeds & Northrup Co., Phila., Pa., adjusts air flow to fuel flow changes rapidly, yet without cycling. Applicable to oil or gas firing, or to dual-fuel furnaces, it meters both fuel

(*Turn to page* 82, *please*)

SUPERSTRONG—
A Perfect Answer to ALL of Your Shipping Needs

The SUPERSTRONG line is a complete line. No matter what type of product you wish to ship, there is a SUPERSTRONG container that can do the job for you.



WIREBOUND BOXES AND CRATES
Veneer or resawn material bound with steel wire, giving adequate protection with lighter container weight.

FRUIT AND VEGETABLE CRATES
All types of wirebound and wooden boxes and crates for fruits and vegetables.

WOODEN BOXES AND CRATES
Recommended for export handling and unusual shipping conditions requiring maximum protection.

PALLETS
Hardwood pallets, reusable and expendable types.

CORRUGATED BOXES
All types of corrugated fiber containers.

WOODEN BEVERAGE CASES
Greater protection at lowest per trip cost.

STARCH TRAYS
Starch, enrober and dipping trays.

SHIPPING SUPERSTRONG CONTAINERS

RATHBORNE, HAIR and RIDGWAY BOX CO.
1440 WEST 21st PLACE • CHICAGO 8, ILLINOIS

"EAGER BEAVER" Army's newest six-by-six. Built by Reo Motors Inc., Lansing, Michigan. Lives up to its name by hauling a full pay load up 60° grades . . . traversing rivers and streams with its engine fully submerged. The South Wind "978" introduces fresh air to keep windshields completely frost-free, cab and personnel comfortably warm.

NEWEST MILITARY VEHICLES CONQUER SUB-ZERO COLD

Reveal Details of Revolutionary New Heating Development for Army

Now ready to roll. Specially equipped to keep rolling under the severest weather conditions! These new Army vehicles boast increased personnel comfort, greater efficiency in sub-zero cold—all the results of an amazing new military heater: the South Wind "978."

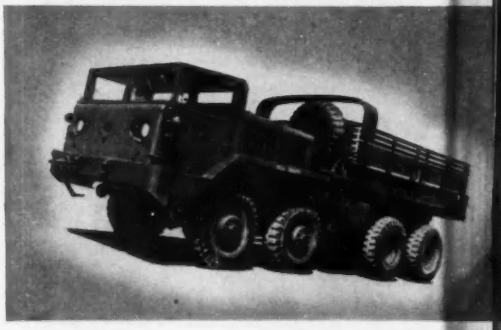
Simplified in design. Compact. This rugged forced air heater preheats, heats, and defrosts in any type of military vehicle—in temperatures as low as 70° below zero. Dependably safe because the combustion air system is completely separated from the ventilating air stream. Always fast acting because warm air circulation doesn't depend on engine heat.

Built to Army Ordnance specifications, the "978" has been standardized by the Army for its winterization program. And because of its many exclusive advantages, promises to be influential in fashioning future designs for commercial car heating, too.

ACT NOW: Find out how this revolutionary new "978" military heater can effectively answer *your* vehicle heating and engine pre-heating requirements. Get the experienced counsel of a trained field engineer. Wire, write or phone Stewart-Warner Corporation, South Wind Division, 1514 Drover Street, Indianapolis 7, Indiana. Do it today.

STEWART-WARNER

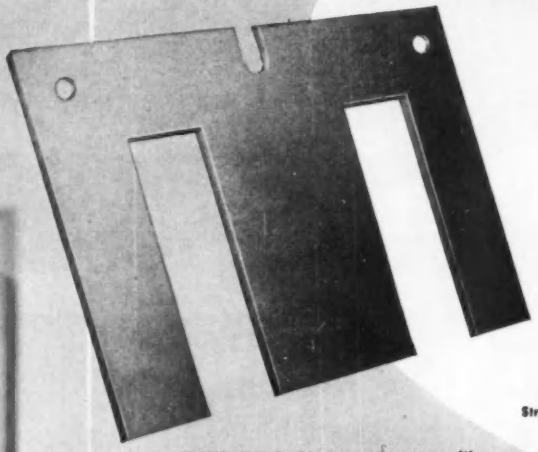
PERSONNEL HEATING *South Wind*
ENGINE AND EQUIPMENT PRE-HEATING
WINDSHIELD DEFROSTING



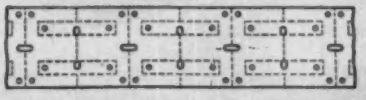
12 WHEELED eight ton heavy duty cargo carrier. South Wind "winterized." A "978" heater keeps frost off the windshields . . . freezing cold outside the cab.

SELF-PROPELLED artillery. New M 41 Motor Carriage with 155 mm. Howitzer. Equipped with two South Wind "978's" for personnel heating, and for heating gun components.

MAKES DIES LAST



TRANSFORMER CORE LAMINATIONS like this are stamped from coil stock .018" to .024" thick. Nested arrangement of "E" and "I" shaped laminations, as shown in sketch below, holds scrap to a minimum.



DANLY AUTOFEED PRESSES PROTECT IMPORTANT DIE INVESTMENT AT KOBZY TOOL COMPANY, CHICAGO

Precision 3-stage carbide dies built to hold burrs within .002" on transformer core laminations represent a die investment that is an important cost factor. That's why Kobzy Tool specified unique press precision features like hardened and

MECHANICAL PRESSES...50 TO

AMPLE BED CLEARANCE above the floor permits efficient piece part handling. Here, finished laminations are delivered—2 "E's" and 2 "I's" per stroke—into stacking chutes from the bottom and side of the die with burred edges stacked in one direction.

IT COSTS LESS TO RUN A DANLY PRESS

DANLY

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

SEND FOR YOUR FREE COPY OF THE DANLY AUTOFEED CATALOG TODAY!

LONGER!

ground slideways on the slide and special bearing alloy gibs on their Danly Autofeed Presses to assure added alignment accuracy and maximum die life!

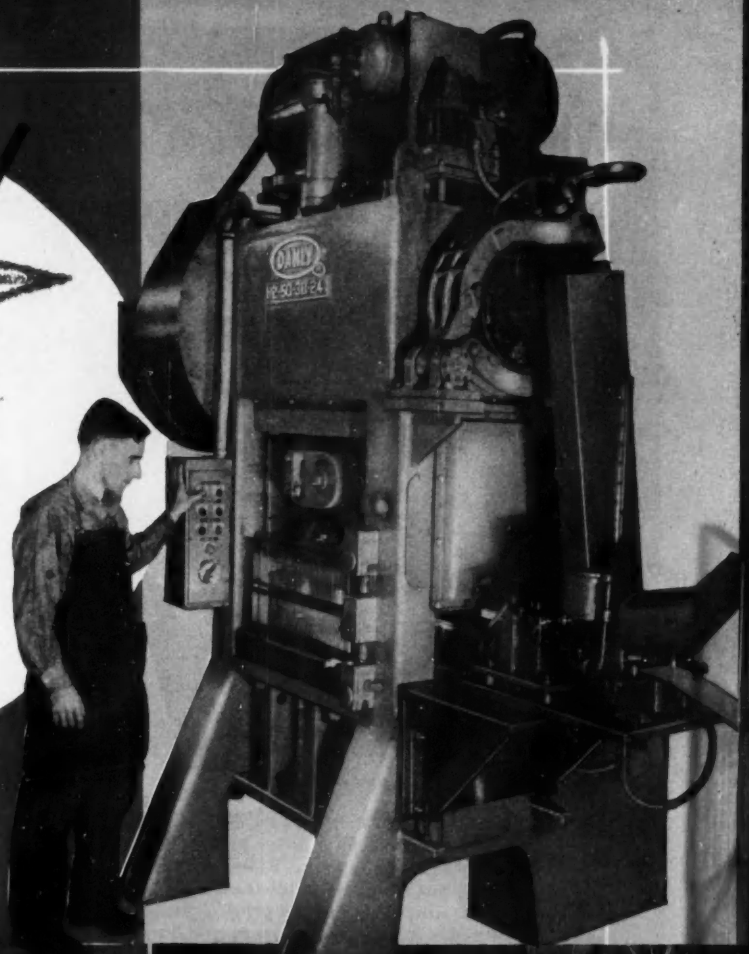
Continuous high-speed operation of the Danly Autofeeds makes the die investment pay off in production efficiency. The exclusive Danly Cool-Running Clutch and automatic lubrication greatly reduce press down time.

Call a Danly engineer today and let him show you how Danly Presses will help solve *your* stamping problem.

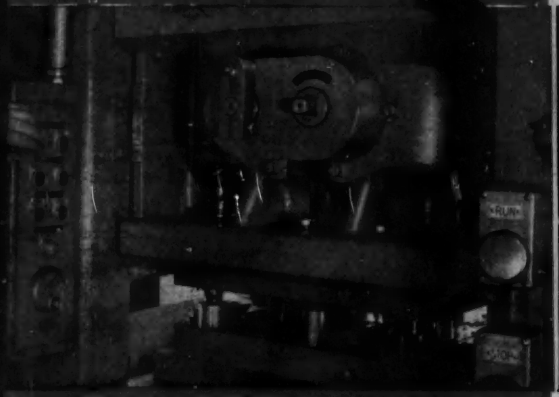
Double Action

Underdrive

3000 TONS



CONTROL CONVENIENCE is assured by placing the master control panel at the operator's station. Selection of various press operating cycles is instantaneous.



POSITIVE SLIDE ADJUSTMENT through improved Danly worm-type adjusting devices provides convenient shut height control and readily locks to prevent "creep". High precision assures slide parallelism at all settings.

PRODUCTION CONTROL plays an important role in any stamping shop when presses are operating at 210 strokes per minute. A Kobzy supervisor is shown here checking an automatic stroke counter.

What LORD PRECISION in Vibration-Control means to YOU

● The precision with which molds are made accounts in part for the accuracy and uniformity of LORD Vibration-Control Mountings. For example, before the form tool which will give shape to new molds is used, it is placed in a comparator which enlarges and projects the contour of the cutting edge for direct comparison with drawings. By such modern techniques, LORD avoids errors and produces molds exactly as designed.

Similar high standards of precision guard quality at every stage of production. This is the reason why satisfaction and dependability accompany every shipment of LORD Mountings. It is also assurance that LORD Mountings will add sales appeal to your product . . . will increase customer appreciation . . . will insure extra years of smooth, quiet, effortless performance.

The LORD Field Engineering Representative in your area will be glad to assist you with the improvement and protection of your product's performance through the control of vibration and shock. Write for your copy of the Lord Natural Frequency Chart and of the Vibration Isolation Chart. Designers and engineers will find them of definite value.

LORD MANUFACTURING COMPANY · ERIE, PA.

Canadian Representative: Railway & Power Engineering Corp. Ltd.

LORD BONDED RUBBER

Vibration-Control Mountings . . . Bonded-Rubber Parts

NEW PRODUCTS

For additional information please use coupon on page 56

(*Continued from page* 78)

and air flow for maximum accuracy of control. Available for use where ratio control alone is desired, the instrument is a component of L & N integrated control of temperature, draft and combustion of large fuel-fired furnaces and kilns. Models are supplied to operate an electric or a pneumatic control valve.

Added speed and sensitivity are obtained with full stability through use of an improved control circuit identical with that incorporated in the latest L & N temperature control systems. Wide range of proportional band and reset control actions makes it easy to adjust the control to the needs of the furnace to which it is applied.

L&N air fuel ratio controller.

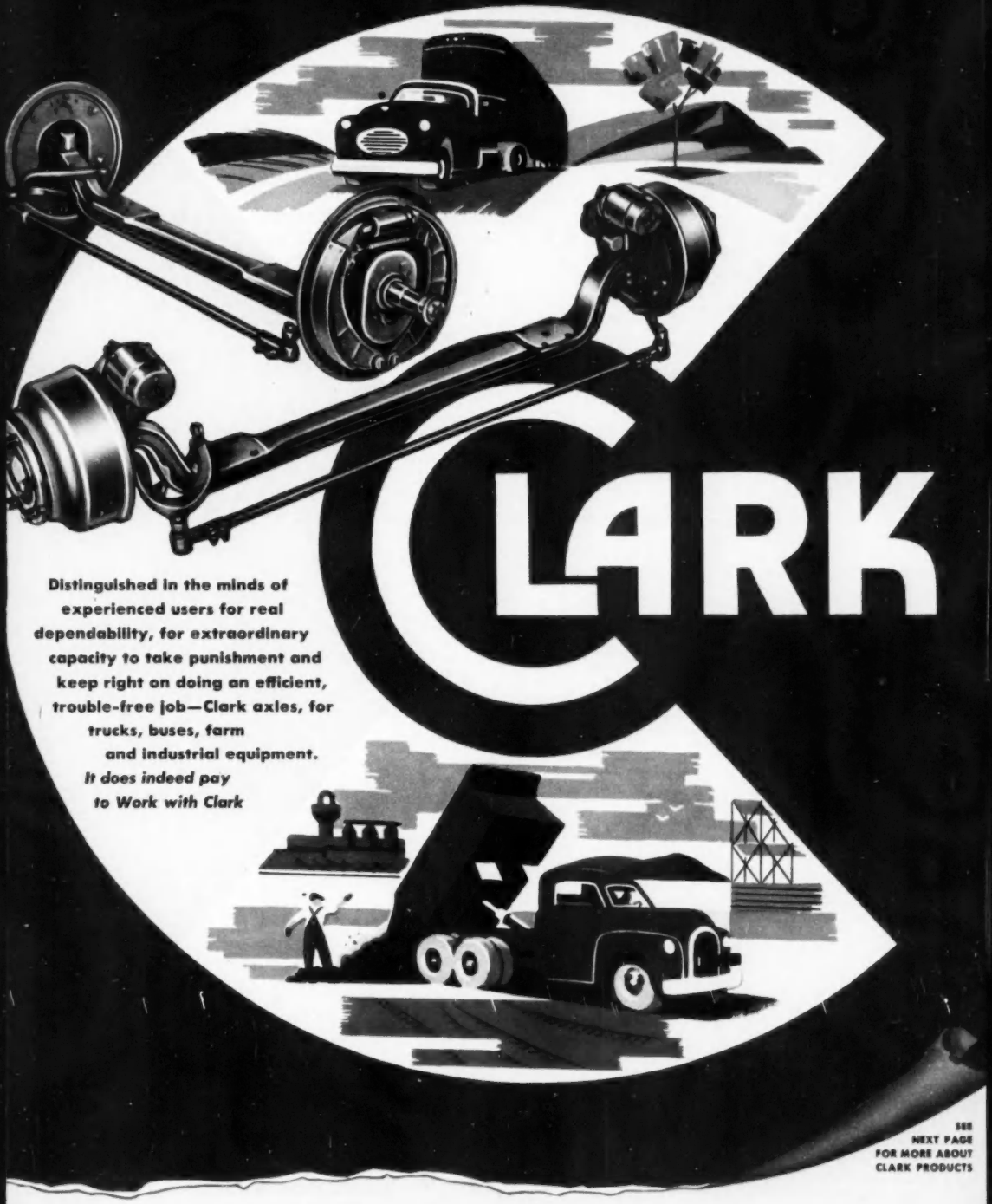
Major sub-assemblies are standardized, readily replaceable. When used with electrically-actuated integrated control, both the temperature control and air-fuel ratio control utilize the same type of plug-in electronic control chassis. When air-actuated control is used, the same type of pneumatic system is built into the pyrometer and ratio controllers. Maintenance, stocking of spare parts and training of instrument men are thus simplified.

The controller comes in a single instrument case which fits into standard panel cutouts. Ratio range extends from 50 per cent deficiency to 100 per cent excess air. Direct remote control of air flow, and transfer from manual to automatic control are provided on the front of the instrument.

F-15—Engineered Shockproof Packaging

A new method of packaging for the engineered shockproofing of shipments, introduced by Lord Mfg. Co., Erie, Pa.,

(*Turn to page* 85, *please*)



Distinguished in the minds of experienced users for real dependability, for extraordinary capacity to take punishment and keep right on doing an efficient, trouble-free job—Clark axles, for trucks, buses, farm and industrial equipment.

It does indeed pay to Work with Clark

SEE NEXT PAGE FOR MORE ABOUT CLARK PRODUCTS

CLARK EQUIPMENT COMPANY, Buchanan, Michigan

Other Plants: BATTLE CREEK AND JACKSON, MICHIGAN

USERS OF CLARK ELECTRIC FORK-LIFT TRUCKS

are well prepared to meet the twin challenges of *labor shortage* and *increased user demands*. They've equipped their manpower with *enough more power* to get the job done, whatever it may be. *Getting the job done* is more important now than ever before; therefore, the fork-lift truck takes on added importance to production of goods essential to the military and to the civilian economy. In equipping workmen with fork-lift trucks, you make them much more productive while easing demands on their energies; you make them more valuable to you—and to themselves.

CLARK ELECTRICS *(Fork Truck capacities, 1000 lbs. to 7000 lbs. Electric-Powered Hand Trucks, 6000 lb. capacity)* are ideal equipment for many handling operations—in cold storage plants, food and chemical processing and similar installations. They actually do more work and at less cost, as a result of these superior features:

- automatic acceleration
- hydraulic brakes
- more dependable power
- easy steering
- faster speeds
- "Dead-Man" safety controls
- finger-tip direction control

As a step toward more power for your manpower, get well acquainted with Clark Electrics, Clark gas-powered machines and the whole Clark Leadership Line of materials handling equipment. Send the coupon and get facts of fundamental value.

CLARK ELECTRIC AND GAS POWERED **FORK TRUCKS**
AND POWERED HAND TRUCKS • INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 15, MICH.
Please send: ☐ Material Handling News ☐ Condensed Catalog ☐ Movie Digest
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AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

PRODUCTS OF CLARK—TRANSMISSIONS • FORK TRUCKS & TRACTORS • AXLE HOUSINGS • GEARS AND FORGINGS • RAILWAY CAR TRUCKS • ELECTRIC STEEL CASTINGS • AXLES • TRACTOR UNITS

NEW PRODUCTS

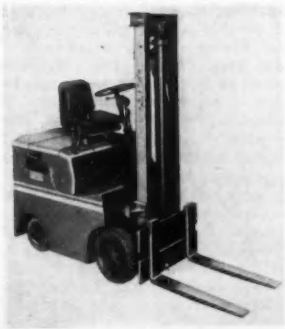
(*Continued from page* 82)

supports the item to be protected within the case by means of shear-type rubber mountings which isolate shock forces and prevent damage when the case is dropped or roughly handled. The shipping mounts are engineered to meet actual shipping conditions, as determined from drop tests using a specific machine or type of equipment designed to be handled. Stresses are calculated for drops from maximum specified height with the case falling in each possible position. Upon the basis of these data, the Lord engineer selects a size and type of flexible mounting having the correct flexibility and restraint in each plane to prevent exposure shock stresses.

Lord engineered shockproof packaging using the controlled flexing action of bonded-rubber mountings.

F-16—Battery-Powered Fork Lift Truck

Provisions of the new Clipper, electric battery-powered fork-lift truck, as announced by Clark Equipment Co., Battle Creek Mich., include increased speed, 2000-lb capacity at 24-in. load-center, "fingertip" directional lever, automatic acceleration, "deadman" safety control, pivot-mounted steering axle and cushion-style tires as standard equipment.



Clark battery-powered fork-lift truck, 2000-lb capacity Clipper.

To simplify operation, the "fingertip" directional control lever is mounted on the steering column for selection of direction of travel and simultaneous engagement of first point-of-power.

Acceleration is automatic, including elimination of jerking and possibility of "human error." Shifts from one point of power to another are timed automatically in accordance with torque requirements. The truck can be moved only when the driver's seat is occupied, or depressed. The pivot-mounted steering axle provides a "no-kick-back" steering feature.

For additional information please use coupon on page 56

(*Turn to page* 86, *please*)

Everything the Auto Industry needs

in LAMPS

Quality TUNG-SOL Lamps are engineered to the highest standards of automotive requirements.

Quantity TUNG-SOL production assures delivery of manufacturers' lamp requirements on schedule.

Performance TUNG-SOL statistical quality control maintains maximum uniformity and dependability.

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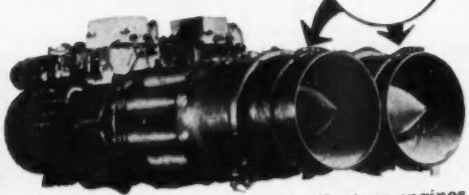
V-Band Couplings Save Cost, Time on T-40 Turbo Prop Engine



One of the most powerful propeller type engines ever cleared for flight uses Marman V-Band Couplings to attach engine to tail cone with a rigid, high-strength connection. This standard unit is an ideal Coupling for all types of flanged joints. A large selection of types and sizes are available to accommodate a wide range of temperature, pressure and strength requirements.

ENGINEERS' NOTEBOOK

(Photo courtesy of General Electric Co.)

Coupling Simplifies Attachment of Jet Engine Tail Pipe

A Marman V-Band Coupling is used to join the tail pipe to the tail cone on the J-47 Engine. Fulfilling stringent requirements, it must maintain a tight seal at all times and provide a structural connection capable of carrying heavy loads under high temperatures. Quick connecting Marman V-Band Couplings achieve significant savings in space, weight, cost and time.

Save cost and design time With Marman Standard Clamps for Special Applications

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MARMAN PRODUCTS CO. INC.

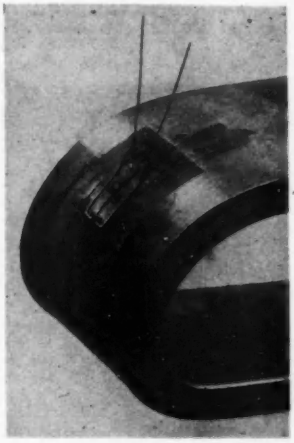
940 W. FLORENCE AVENUE
INGLEWOOD, CALIFORNIA

NEW PRODUCTS

For additional information please use coupon on page 56

(*Continued from page 85*)

F-17—Post-Yield Strain Gage



New SR-4 "Post-Yield" strain gage is designed by Baldwin-Lima-Hamilton Corp., Phila., Pa., to accurately measure strains up to 10 per cent in materials or parts. Identified as Type PA-3, it enables measurement of strains far beyond the range of other SR-4 bonded resistance wire strain gages, the company declares. The gage has a flat-grid paper-base construction and is supplied with a special air-drying cement. Resistance is 120 ohms, gage factory is 2.0, gage length, 13/16 in., and minimum trim width, 15/32 in.

F-18—Voltmeters and Ammeters

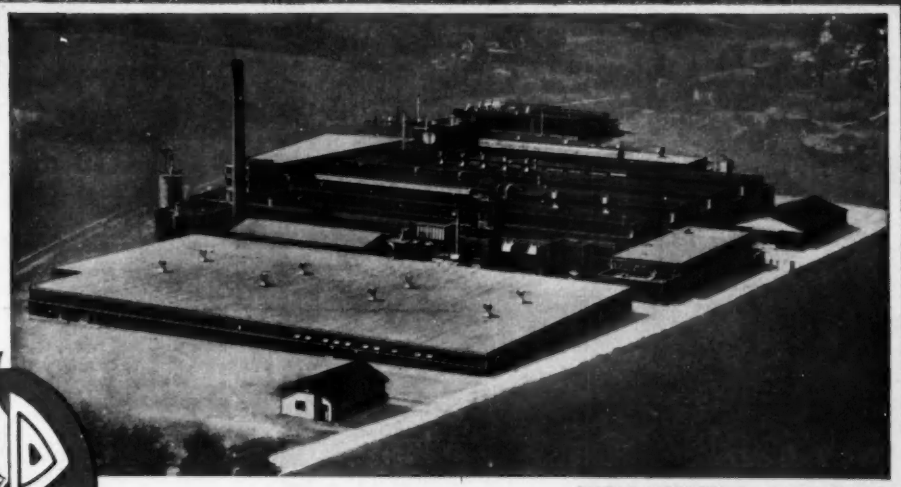
New recording voltmeters and ammeters, "Series 500," brought out by the Bristol Company, Waterbury, Conn., make a continuous record of voltage or current on an 8-in. circular chart, and provide a new measuring mechanism among other improvements.

The new moving-iron measuring mechanism produces a high actuating torque at a low electrical burden. The mechanism has shock-protected precision stainless steel bearings, magnetic damping, and a locking device to prevent damage due to rough handling.

Instruments are housed in a compact die-cast aluminum alloy case which is moisture-, fume-, and dust-proof. Recording ammeters and voltmeters are both furnished in a variety of models for wall, surface-panel or flush-panel mounting, for either open terminal or conduit connection, as well as in portable and pole mounting models.

(*Turn to page 88, please*)

Are You Seeking a Supplier of ALUMINUM CASTINGS?



PERMITE

Here at Aluminum Industries, Inc., are proven facilities you can count on for supplying aluminum alloy castings of uniformly high quality, in any sizes and in any quantities you need. Just check and compare:

- One of the largest aluminum foundries in the United States for the production of Permanent Mold, Semi-Permanent Mold and Sand Castings.
- Ample capacity for immediate scheduling of your requirements.
- Well-equipped department for machining and finishing aluminum castings.
- Tool room, equipped with the latest type machine tools.
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- Pattern shop for pattern repair and maintenance.
- Engineering Department for application of the best engineering principles, all the way from the design stage to the finished casting.
- Ample warehousing facilities, favorably located for shipping.
- Secondary aluminum plant for the refining of scrap metals.
- Foundry personnel with the skill and "know-how" developed in over 30 years of experience in working with aluminum and its alloys.

Send for new bulletin telling how and why you can depend upon Aluminum Industries, Inc., for the aluminum castings you need in your production. Ask for Bulletin No. 20-A. Recommendations and estimates given without obligation.

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ALUMINUM PERMANENT MOLD, SAND and DIE CASTINGS...HARDENED, GROUND and FORGED STEEL PARTS

NEW PRODUCTS

For additional information please use coupon on page 56

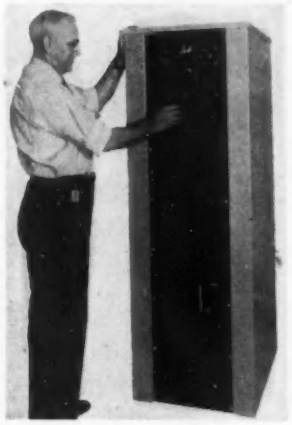
(*Continued from page 86*)

F-19—Induction Voltage Regulators

A redesigned line of single-phase Inductrols in standard ratings of 9.6 kva to 24 kva is available from General Electric Company's Transformer and Allied Product Divisions, Schenectady, N. Y.

Newest addition to the G-E family of dry-type induction voltage regulators, the single-phase units widen the field of application in which uniform voltage control can be obtained economically with small regulators. They are available for single-phase circuits, 600 volts and below, up to 1,000 amps.

With standard controls, the single-phase Inductrols can be used for secondary circuit regulation where lighting and power are supplied from the same lines. In addition, they can be used in laboratories for controlling voltage in calibrating and testing meters, instruments and instrument transformers and for operating resistance and induction furnaces.



G-E single-phase Inductrol.

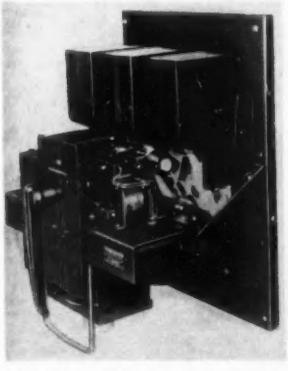
Basically, the Inductrol consists of a shunt winding located on the rotor and a series winding located on the stator. Varying the position of the rotor with respect to the stator causes a variation of voltage in the series winding that will raise or lower the output voltage gradually, as required by changes in load.

F-20—Low-Voltage Air Circuit Breaker

Added to the line of DB breakers manufactured by the Westinghouse Electric Corp., Pittsburgh, Pa., is a low-voltage air circuit breaker, the DB-50. With an interrupting capacity of 50,000 amps, the DB-50 joins the DB-15 and DB-25 for application in low-voltage industrial and commercial power distribution systems, central station auxiliaries, motor starting duty, etc.

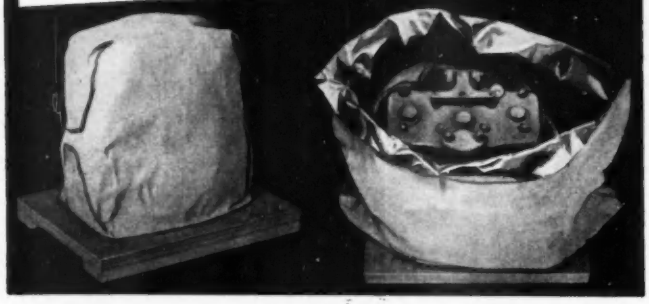
The DB-50 provides a completely new air-delayed series overcurrent tripping

(*Turn to page 92, please*)



Westinghouse DB-50 air circuit breaker.

FOR FULL PROTECTION OF MILITARY MATERIALS In Transit and Storage—



KENNEDY *ENGINEERED* DIMENSIONAL PACKAGING

Are you having troublesome, costly problems with *specified* packaging of military materials and equipment? Then call in Kennedy . . . fabricator of paper (waxed, laminated, creped, etc.), flexible plastics (vinyls, polyethelene, Saran), and laminated foils with or without cloth backs. Armed with all-out experience in two world wars and fully prepared to meet the demands of today's defense program, Kennedy is your dependable source of moisture-proof desiccated packaging and water-proof case liners that provide the complete protection so vital to products in transit and storage. Take advantage of Kennedy's knowledge, ability and production facilities. You'll benefit.

TAILOR-MADE TO MILITARY SPECIFICATIONS

Desiccated Packaging:
MIL-E-6060
(supersedes ANE-1-b)
MIL-C-6056
(supersedes ANC-67-b)
JAN-P-116
JAN-P-117
JAN-P-131
ANP-13-a

Case Liners:
JAN-P-125
(to be superseded by MIL-L-10547-a)

DIMENSIONAL PACKAGING
Kennedy
CAR LINER AND BAG COMPANY, INC.
SHELBYVILLE, INDIANA

NEW YORK PHILADELPHIA BUFFALO CLEVELAND DETROIT CHICAGO
LOS ANGELES SAN FRANCISCO PORTLAND SEATTLE

BALL bearings are necessarily made to close tolerances which apply not only to the balls and races but also to the retainers which must have exact dimensions and shapes. This matter of retainer quality has been given careful study by the Stephens-Adamson Mfg. Co., Aurora, Illinois, maker of the well-known SealMaster Industrial ball bearing units. The company collaborated closely with the Revere Technical Advisory Service in working out the specifications and forming procedures for its brass retaining rings. As a part of this joint activity, Revere made a full survey of Stephens-Adamson requirements, with the object of standardizing and simplifying specifications for the benefit of both the engineering and the purchasing departments. The success of this work is indicated by this statement from the Superintendent of SealMaster bearing production: "First and foremost, I am pleased with the uniformity of gauge and temper of the Revere brass we have been receiving. This uniformity makes it possible to produce ball retainers of very close tolerance, with a minimum of rejections and at comparatively low unit cost. Furthermore, I have appreciated the dependable delivery service and the cooperation of the Revere organization."

In these times of scarcities, when it is more than ever necessary to reduce waste and save metal, you may wish to take advantage of Revere's skill and know-how in non-ferrous metals. Just get in touch with the nearest Revere Sales Office.

ABOVE, the largest retainer made for a SealMaster industrial ball bearing unit, contrasted with the smallest block and retainer.

BELOW, three of the steps in retainer production: blanked, formed and punched, and assembled part ready to receive the balls.

REVERE 150th YEAR OF SERVICE TO AMERICA

COPPER AND BRASS INCORPORATED

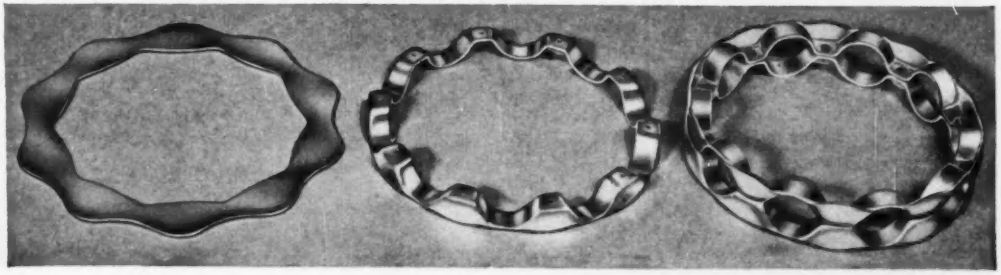
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

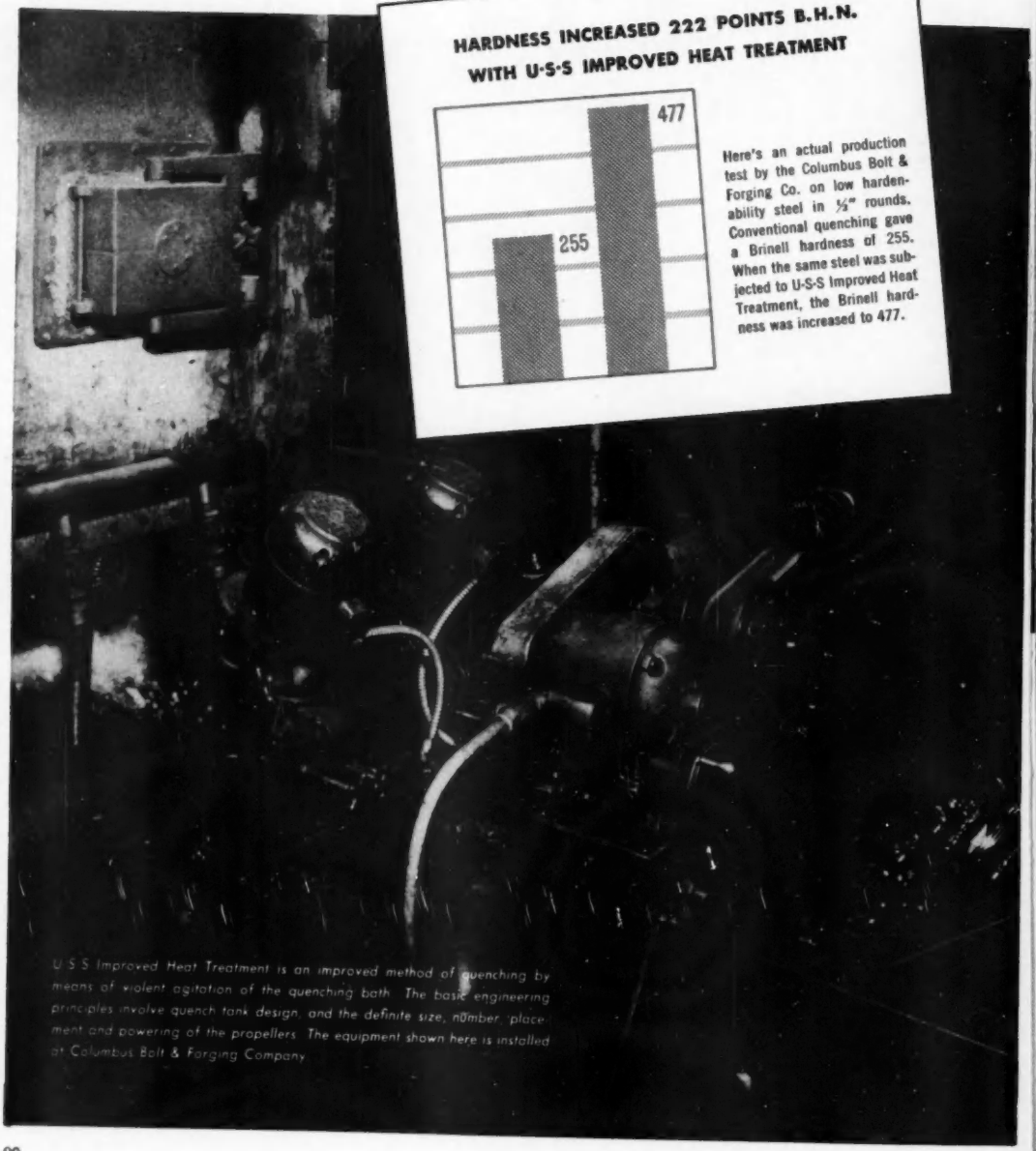
Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



HOW TO GET THE MOST OUT OF

—keep a sharp eye



HARDNESS INCREASED 222 POINTS B.H.N. WITH U·S·S IMPROVED HEAT TREATMENT

Here's an actual production test by the Columbus Bolt & Forging Co. on low hardenability steel in ½" rounds. Conventional quenching gave a Brinell hardness of 255. When the same steel was subjected to U-S-S Improved Heat Treatment, the Brinell hardness was increased to 477.

U S S Improved Heat Treatment is an improved method of quenching by means of violent agitation of the quenching bath. The basic engineering principles involve quench tank design, and the definite size, number, placement and powering of the propellers. The equipment shown here is installed at Columbus Bolt & Forging Company.

THE ALLOY STEEL YOU'RE GETTING on quenching methods

TODAY, as critical alloying elements become scarce, all users of alloy steel are faced with the necessity of getting the most out of the steel they're receiving.

In most cases, this puts the problem squarely up to the heat-treater. Better heat-treatment methods can often do the job.

If you encounter difficulties, don't be too quick to blame the steel or the heating practice. The answer may be better *quenching* methods. More specifically, your problem might be solved with U·S·S Improved Heat Treatment — a superior quenching technique developed by United States Steel.

U·S·S Improved Heat Treatment extracts heat rapidly and *evenly* from every part of the material's surface. This treatment assures accurate timing, allowing removal of the material from the quenching bath while a certain amount of residual heat is present. Elapsed time from quench to tempering treatment is held to an absolute minimum. This not only improves mechanical properties; it also reduces cracking. And, this quenching method improves machinability by minimizing the formation of free ferrite in hypo-eutectoid steels.

The use of this quenching process is available to you without charge.

United States Steel does not manufacture or sell heat-treating equipment, but our metallurgists will be glad to analyze your heat-treating methods and make suggestions that may give you more uniform hardness, less rejects and less retreatment.

UNITED STATES STEEL COMPANY, PITTSBURGH
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

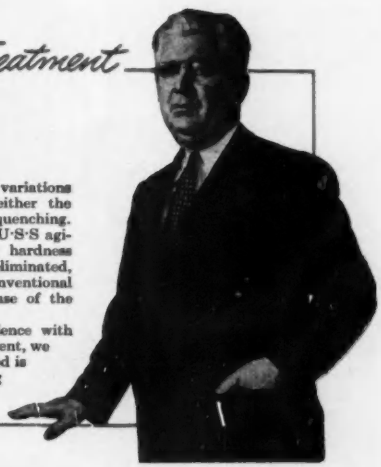
Comments on U·S·S Improved Heat Treatment

by Mr. R. E. Christin, Chief Metallurgist
Columbus Bolt & Forging Co., Columbus, Ohio

"Quenching is a process often neglected in heat treatment. We feel it is just as important (if not *more* important) than any other phase of heat treatment. There is a tendency to concentrate too much on the heating—and lay too much blame for failure to the heating—when proper quenching could produce the objectives desired. Heating, even in the ideal environment, can be inadequate if quenching is faulty.

"Before we installed U·S·S Improved Heat Treatment, we occasionally encountered hardness variations in the as-quenched condition. These variations were loosely attributed to either the steel, or the heating or the quenching. However, after adopting the U·S·S agitated quench process, these hardness variations were practically eliminated, obviously indicating that conventional quenching was the chief cause of the hardness variations.

"After seven years' experience with U·S·S Improved Heat Treatment, we are convinced that this method is the answer to most hardening problems."



Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO OR PITTSBURGH

1-933

UNITED STATES STEEL

Soft Touch
for an Iron Fist
Twin Disc Hydraulic Power Take-off
More and more heavy-duty construction and industrial equipment is designed so that power is transmitted through a Twin Disc Hydraulic Power Take-off.
For this fluid drive cushions out shocks and strains. Impacts and stresses are absorbed. Overloads can't stall the engine or motor because only the output end of the hydraulic unit stops.
And power "hangs" on—the engine can operate at its most effective torque—can come up to speed fast and smooth—to speed up the work-cycle.
If you have equipment that must do an iron fist job, give it a soft touch with a Twin Disc Hydraulic Power Take-off—and watch the work go faster. Available for prime movers developing up to 700 hp.
TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois
BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

NEW PRODUCTS

For additional information please use coupon on page 56

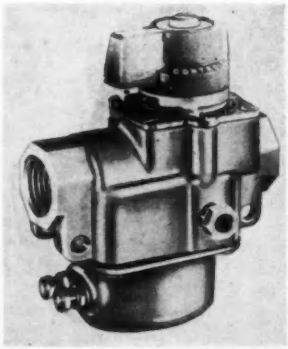
(*Continued from page* 88)

device, with all elements completely adjustatble, that affords long-time delay on overloads and instantaneous tripping of fault currents. For use on feeder and back-up breakers, overcurrent trip units including both a long-time delay and short-time delay element can be specified, thus providing for selective operation on fault.

Rated at 600 volts a-c, 250 volts d-c, the DB-50 has a continuous rating of 100 to 1600 amps. It can be operated manually, or by either d-c solenoid or a-c Rectox solenoid.

All parts of the DB-50 are removable as complete units. De-ion® arc interruption provides for quick arc extinction and longer contact life.

F-21—Gas Cock Safety Valve



General Controls MR-5 gas cock safety valve.

Put out by General Controls Co., Glendale, Calif., is their MR-5 gas cock safety valve unit claimed the smallest combination safety and plug valve in the field of advantage in making up manifold structures. This pilot safety valve providing "fail safe" operation, is principally a safety shut-off valve, consisting of a thermocouple safety incorporated into a hi-flow gas cock valve structure. Through its use and its lighting cycle, it is impossible to allow passage of gas into the main burner because of its "safe lighting" design, the company points out.

Available in pipe sizes ranging from ⅜ in. to ¾ in. with high gas capacity, it is useful in single couple (green band) and pilot generator (yellow-blue band) installations.

(*Turn to page* 138, *please*)

Searching for a reliable supplier of
noncritical material for
TRUCK INSULATION and TRIM?
The items illustrated . . . and many other similar items are currently being made by us of noncritical materials for leading truck manufacturers.
If you need vibration deadener materials, headlinings, floormats, heelboard panel insulation, seat back coverings, or other long wearing interior trim, consult Burlington Mills now.
Let us help engineer your trim or insulation problems — where critical materials may be involved.
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Bur-Tex

New Defense Facilities

(*Continued from page 54*)

— N —

National Cash Register Co., Dayton
Aircraft—$5,000,000

National Water Lift Co., Kalamazoo, Mich.
Airplane parts—$179,700

New Hampshire Ball Bearings, Inc., Peterborough, N. H.
Ball bearings, miniature—$520,760

W. H. Nichols Co., Waltham, Mass.
Aircraft engine pumps—$202,934

Nigg Engineering Corp., Covina, Calif.
Airplane flap tracks—$13,905

Norma-Hoffmann Bearings Corp., Stanford, Conn.
Instrument ball bearings—$180,000

North American Aviation, Inc., Los Angeles, Calif.
Aircraft—$6,508,495

— O —

The Oilgear Co., Milwaukee, Wis.
Ordnance and hydraulic pumps—$1,259,993

— P —

Packard Motor Car Co., Macomb Co., Mich.
Turbo jet engines—$15,244,800

Parker-Majestic, Inc., Detroit
Special bearings—$36,687

Plane Parts, Inc., New Haven, Conn.
Airplane parts—$42,450

Precision Piece Parts Inc., Mishawaka, Ind.
Aircraft assemblies—$31,670

Provost Forged Products, Detroit
Ordnance—$5,037

— Q —

Quaker Rubber Corp., Philadelphia
Aircraft—$256,198

— R —

Raybestos-Manhattan, Inc., Crawfordsville, Ind.
Tank clutch plates—$1,757,676

— S —

Sangamo Electric Co., Springfield, Ill.
Ordnance—$463,903

Scovill Manufacturing Co., Waterville, Conn.
Aircraft fasteners—$30,834

Servel, Inc., Evansville, Ind.
Airplane parts—$1,231,000

Shuler Axle Co., Louisville, Ky.
Truck axles—$12,626

Southworth Machine Co., Portland, Me.
Airplane parts—$43,122

Standard Steel Spring Co., Coraopolis, Pa.
Springs, universal joints—$175,000

The Steel Improvement & Forge Co., Cleveland, Ohio
Aircraft engine parts—$169,162

Studebaker Corp., South Bend, Ind.
Aircraft—$3,616,240

Sturgess, Inc., Glendale, Calif.
Aircraft—$147,866

— T —

Tools, Inc., Newark, N. J.
Aircraft ordnance—$4,606

The Torrington Co., Torrington, Conn.
Anti-friction bearings—$1,645,098
Roller bearings—$281,566

Towle and Son Co., Philadelphia, Pa.
Aircraft engine instruments—$49,500

Tru-Ber Mfg. Co. Culver City, Calif.
Aircraft parts—$71,153

— W —

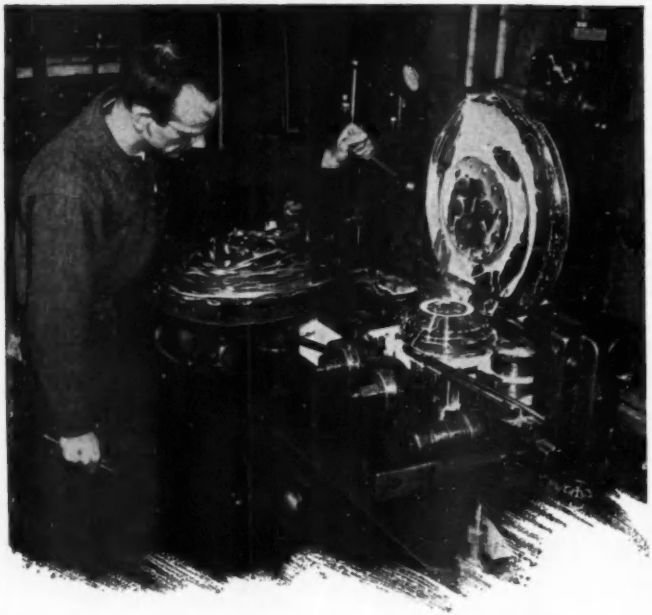
Wells Aircraft Parts Co, Los Angeles
Aircraft parts—$95,000

Wyman-Gordon Co., Worcester, Mass.
Aircraft—$2,814,626

Italy's Car Output Jumped 37% in First Quarter

During the first quarter of 1951, Italian automobile production jumped 37.2 per cent over the corresponding quarter of last year, while exports were boosted 108.5 per cent, according to returns issued by the A.N.F.I.A.A. (the national Manufacturers' Association). The output of passenger cars was 32,160, commercial vehicles 6796, and buses 556, making a total of 39,512. The increase was greatest in passenger cars. Buses showed a loss.

BRAINARD TUBING IN THE MAKING...



THE WELDING OPERATION involves a split electrode with current passing from one side to the other, heating the tube to welding temperature. The side pressure rolls then force the bond. Excess metal is peeled off, making a clean, neat tube. Busy as we are in times like these, this operation gets careful supervision at Brainard. We have complete control of every operation from ore to tube. That's why it will pay you to call on Brainard first when you have a job for electric welded mechanical tubing. Straight or fabricated. Sizes: ½" to 4"—.025 to 165.

Sales offices: Atlanta, New York, Cincinnati, Pittsburgh, Buffalo, Chicago, Philadelphia, Dearborn, Cleveland, Tonawanda, N.Y., Rochester, Indianapolis, Nashua, N.H. Sales representatives: Sharonsteel Products Co., Dearborn, Mich., Grand Rapids, Mich. and Farrell, Pa. Fred J. Reynolds, Davenport, Iowa. Brass & Copper Sales Co., St. Louis, Mo. and Kansas City, Kan. Julius Schulz, Dallas, Texas.

Brainard
STEEL COMPANY
WARREN, OHIO

Multiseal
ALL-STEEL, HYDRAULIC
SEAL RINGS
provide constant action
over full temperature range from
minus 70° F to plus 450° F
NOT POSSIBLE WITH NON-METALLIC PACKINGS
ATTRACTIVE COST SAVINGS!
FOR AUTOMATIC TRANSMISSIONS AND
INDUSTRIAL AND MARINE UNITS
Policy
MUSKEGON
Piston Rings
PLANTS AT MUSKEGON AND SPARTA
"THE ENGINE BUILDERS' SOURCE"

"CHICAGO"
precision valve gear parts

Hydraulic Tappets • Mechanical Tappets • Roller Followers • Push Rods • Self Locking and Standard Thread Adjusting Screws • Valve Spring Retainers Split Valve Locks • Rocker Arm Shafts •

Connecting Rod Bolts.....Hydraulic Cylinder Pistons
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Flywheel to Crankshaft Screws.....Diesel Energy Cells
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Special Screw Machine Parts 1/16" to 5" Diameter • Cap Screws • Set Screws • Nuts • Studs • Taper Pins • Socket Screw Products.

The CHICAGO SCREW COMPANY
2801 WASHINGTON BLVD.
BELLWOOD, ILL.
Established 1872

Machining Ford Mercury Transmission

(*Continued from page 50*)

the case, serving as the regulator mounting face, is finished by grinding in a No. 221 Heald Bore-Matic. In addition, the pan face is finished by lapping in special Norton lappers; while the pump face is finish-ground in a Heald Model 271. These operations produce mating surfaces capable of sealing the unit against the high fluid pressure within the case.

At the end of the machine line the cases are washed, then dipped in rust-proofing oil as protection while in stores. Incidentally, all component parts of the transmission are delivered to stores in special wire containers and held in these containers until scheduled for final assembly. When ready to issue to final assembly, all of these parts are routed through an enormous Detrex degreaser which has three separate conveyor lines threading through. This gives the parts a final chemical cleaning immediately ahead of assembly. It has been found that the oiling operation on the case, mentioned above, serves a double duty. After passage through the Detrex machine, oil will remain in seams or surface cracks, if any are present, and will leak out to the surface to provide an unmistakable indication of cause for rejection.

Another of the interesting cast iron parts for this transmission is the rear drum which, together with a front plate, constitutes the planetary cage. This drum is an intricately cored part containing pockets for the planetary pinions and lug extensions for riveting to the cover plate. It is turned and formed in successive settings in a six-station Model A Bullard, an eight-spindle Model D Bullard, and a six-spindle Model D Bullard.

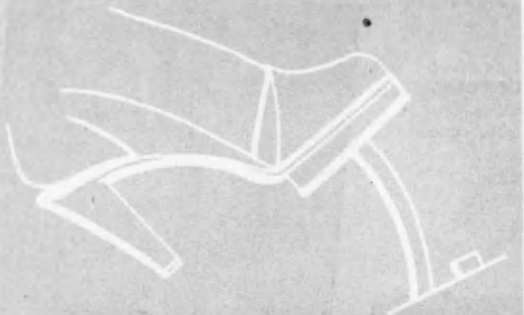
This is followed by finish-turning the OD, finish-facing both sides of the flange and turning the hub diameter in a No. 2112C two-spindle, Ex-Cell-O precision boring machine.

Another interesting feature of the line is the third transfer machine, this one being a Baush 15-station unit, tooled for drilling nine holes, milling six pinion pockets, end-milling three rivet holes, end-milling three short pinion shaft holes in the front end, countersinking, and reaming the long and short pinion shaft bores; also rough- and finish-reaming the three rivet holes.

Following certain other detail operations, designed to provide over-all finish of maximum quality, the part is checked for balance in the familiar Gisholt Dynetric balancer and drilled suitably to provide balance within ¼-oz in.

An unusually neat trick is the rivet-

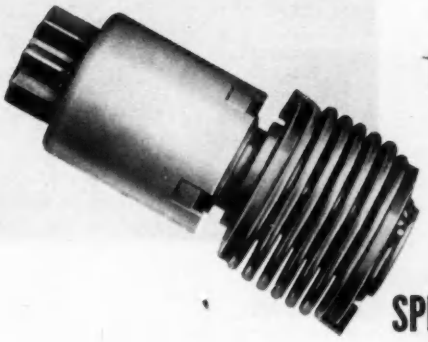
(*Turn to page 100, please*)



CLUTCH PEDAL STARTING

COSTS LESS

WITH Bendix STARTER DRIVE



Clutch pedal starting is safer because the clutch must always be disengaged before starting and disengaging the clutch also minimizes strain on battery and starting motor. Like practically every type of starting system, clutch pedal starting costs less with Bendix* Starter Drive. This unique combination of quality and low cost is made possible by Bendix exclusive design features. For example, the Bendix Starter Drive requires no actuating linkage and the solenoid may be placed in any convenient position. Result—starting motor can be mounted more easily and in more positions. Also the Bendix Drive has fewer parts and needs no adjustments. If you want true economy from installation to service, plus performance proven by over 85,000,000 installations, be sure to specify Bendix Starter Drives. Your inquiry will receive immediate attention.

*REG. U.S. PAT. OFF.

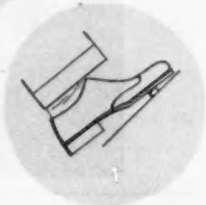
ECLIPSE MACHINE DIVISION of

Bendix AVIATION CORPORATION

ELMIRA, NEW YORK

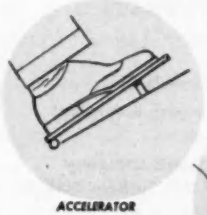
Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

PUSH BUTTON

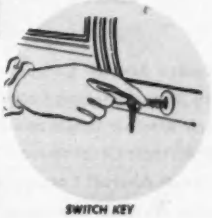


FLOOR BUTTON

SPECIALISTS IN ALL TYPES OF STARTING!

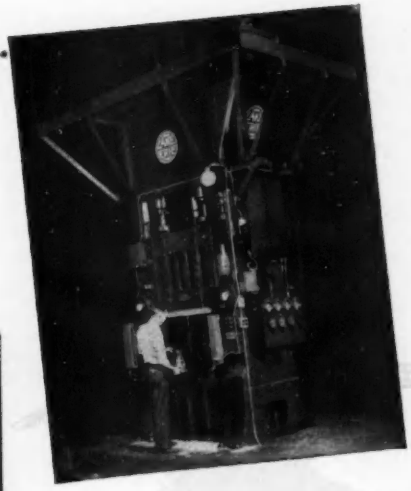


ACCELERATOR



SWITCH KEY

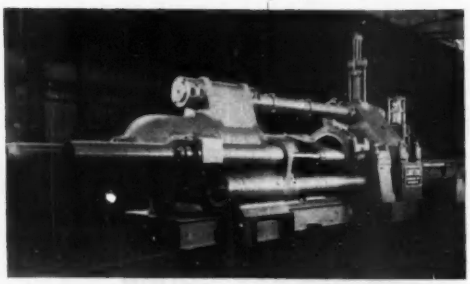
CLUTCH PEDAL



● **150 Ton Triple-Action Hydraulic Press,** which can be used as a single, double or triple action unit. Shown here it is drawing a long truncated cone for turbo-jet aircraft engines. This part produced in a single draw is one of the most exacting metal forming jobs performed by industry today.

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

. . . simplifying difficult production



● **1500 Ton Lake Erie Hydraulic Press** for the extrusion of non-ferrous metals. This horizontal type extrusion press is available in capacities from 300 to 5000 tons. These presses are noted for their ability to hold close tolerances at high production speeds.

★ **LAKE ERIE HYDRAULIC PRESSES** have answered production problems for these and other Aircraft manufacturers.

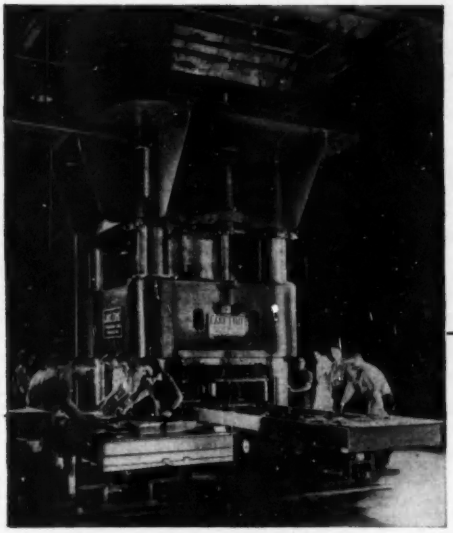
Aeronica Aircraft Corporation
Avco Manufacturing Corporation
Beech Aircraft Corporation
Bell Aircraft Corporation
Bellanca Aircraft Corporation
Boeing Airplane Company
Consolidated Vultee Aircraft Corporation
Curtiss-Wright Corporation
Douglas Aircraft Company, Inc.
Fairchild Engine & Airplane Corporation
General Electric Company Aircraft Gas Turbine Division
Grumman Aircraft
Kellett Aircraft Corporation
Glenn L. Martin Company
North American Aviation, Inc.
Northrop Aircraft, Inc.
Piasecki Helicopter Corporation
Piper Aircraft Corporation
Republic Aviation Corporation
Thompson Products Inc.
United Aircraft Corporation
Chance Vought Aircraft Division
Pratt & Whitney Aircraft Division
Sikorsky Aircraft Division

● **750 Ton Lake Erie Double Action Hydraulic Press,** shown here is an unusual application, forming large cowl rings with inexpensive wooden dies. This extremely versatile 4-column press can be furnished in many standard sizes or built to your specifications.

● **1000 Ton Lake Erie Hydraulic Press.** This high speed fully automatic press of welded band construction is being supplied in large numbers for the production of jet engine blades.

● **1000 Ton Double Action Presses** of rugged side housing design are equipped with two 125 ton hydro-pneumatic cushions. Shown forming bomber parts, these presses have beds 120″x64″.

problems in the Aircraft Industry



● **3000 Ton Lake Erie Forming Press** equipped with rubber pad. Available in capacities from 500 to 7000 tons producing up to 2000 p.s.i. on the work. High speed hydraulically operated loading tables or electrically operated tables (as shown above) are available for all press sizes.

Lake Erie's broad experience in the production of aircraft components—from air frames to jet engines—is conclusively proven by the use of Lake Erie presses in the factories of the best known aircraft manufacturers and their suppliers, throughout the world.

This experience in applying hydraulic press power to the aircraft industry's requirements for precision, speed and versatility of usefulness, has resulted in our being able to supply a wide range of presses in a great variety of capacities and designs. No matter what your problem a Lake Erie engineer will be glad to study your needs thoroughly and help you meet production requirements with maximum efficiency.

LAKE ERIE ENGINEERING CORP.

MANUFACTURERS OF
HYDRAULIC PRESSES AND SPECIAL MACHINERY

★

General Offices and Plant:

509 Woodward Avenue Buffalo 17, New York

DISTRICT OFFICES IN NEW YORK, CHICAGO and DETROIT

Representatives in Other Principal Cities in the United States and Foreign Countries

Manufactured in Canada by: Canada Iron Foundries Limited

LAKE ERIE HYDRAULIC PRESSES are available in any size...standard, modified and special designs—horizontal and vertical types—for Metal Working—Plastics Molding—Forging—Metal Extrusion—Processing—Vulcanizing—Laminating—Stereotype Molding—Matrix Forming—Briquetting—Baling—Special Purpose. LAKE ERIE ®

ing of the cover to the drum. The rivets are pressed in, then spun over, one at a time, in single-spindle high speed drills. Rivet heads are countersunk and are spun by means of a suitably formed cemented-carbide tool. The combination of pressure and high rotative speed serves to heat the rivet so that the head is actually plastic and flows into place in the same fashion as in hot riveting.

Final operations on the drum include—precision-boring of the hole in the bushing, grinding the inner thrust face in a Heald Size-Matic, grinding the large hub diameter in a Bryant. This is followed by semi-finish-boring the short and long pinion holes; then finish-boring the same holes in two setups in Ex-Cell-O precision boring machines having a three-position index, taking one set of bores at a time. The latter serves to true the previously drilled and reamed holes and assures precise spacing.

The small hub diameter is ground in a Norton external grinder, then the outer thrust face is finished in a Norton angular wheel-head grinder. These operations serve to true the entire assembly, which is then balanced in the Gisholt Dynetric.

A brief comment on gear practice may be of interest at this point. Most of the gears used in the Ford automatic transmission are shaved and certain ones are crown-shaved as well, to prevent edge loading, increase durability, and reduce noise. Currently Warner Gear is using gear finishers made by National Broach as well as Michigan Tool, both types using the circular cutter. Red Ring gear finishers are employed for crown-shaving as well as straight shaving in the present set-up, depending upon the type of gear.

An example of an extreme problem is found in the cutting of the sun gear on the forward sun gear shaft. Here is a hollow shaft of relatively small diameter, almost 11 in. long, on which it is required to cut a relatively larger diameter helical gear located near one end. This is done in one of the new eight-spindle Cleveland Rigidhobbers, using a three-lead hob with a feed of 0.060 in. To maintain correct alignment on this slender shaft, Warner Gear found it necessary to add hydraulic clamping means at each station.

This gear has the following major specifications:

No. teeth, 27.
Normal pitch, 14.
DP, 13.15566.
Helix angle, (RH) 20 deg.
Full depth, 0.1678 in.

It is crown-shaved to limits of 0.0003-0.0005 in.

To assure accuracy of gear cutting and shaving, small gears such as the long and short planet pinions have the bores broached accurately after forming in automatics. This is done in the special American broaching machine, fitted with six magazine chutes which feed the work automatically to six broaching stations, finishing six bores at each stroke. This machine is capable of producing more parts an hour than the present manual feeding arrangement permits, the practical limit at present being about 2200 pieces an hour.

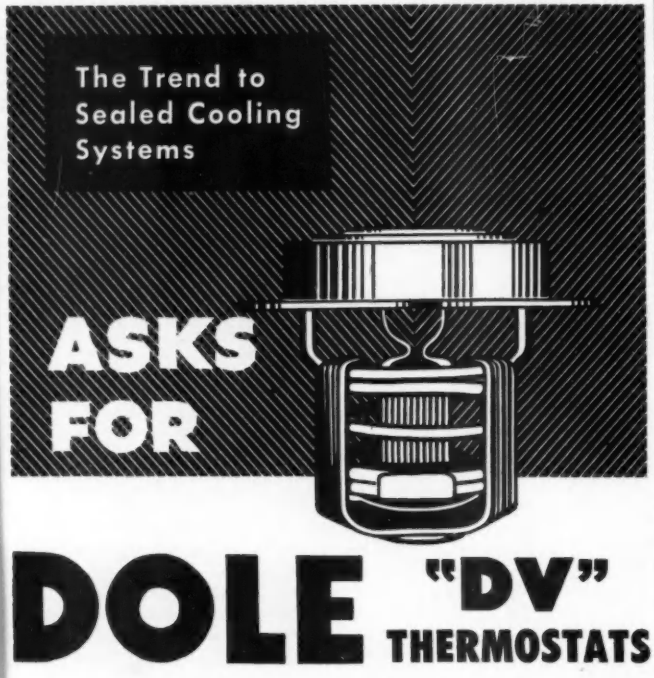
Following this operation and immediately before gear cutting in Rigidhobbers, each blank is pressed onto a nicely fitted arbor in a small Colonial press mounted at the gear cutter. Since the fit is exacting, special arbors with chromium-plated surfaces are provided for selective fitting when the standard arbor is not suitable.

The Michigan Tool shaving machines, as illustrated, are fitted with a track-type conveyor having special clamping fixtures to hold the work. When the work reaches the shaving station, it is automatically unclamped and held on centers to provide the necessary support for shaving.

The Red Ring gear finishers, on the other hand, employ a magazine feed chute in front, permitting the work to roll down to the work station by gravity. It may be noted that the long pinions are crown-shaved, both sections being held to a limit of 0.0003-0.0005 in. crown.

Another item of interest is that all

(*Turn to page* 102, *please*)



DOLE "DV" THERMOSTATS

More than eleven years of gradual modernization in automotive cooling systems calls for an answer in the design of automotive thermostats.

Dole gave the industry that answer in the Dole "DV," a thermostat completely new in principle and performance. It assures all the advantages of motor temperature control on old type cooling systems, but . . .

Significantly it is the "DV" that delivers those advantages also on the smaller radiators with high pump pressure of the modern sealed system—consistently and continuously.

CONTROL WITH DOLE

THE DOLE VALVE COMPANY
1901-1941 Carroll Avenue, Chicago 12, Illinois
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SUNTAC ENDS LUBRICATION HEADACHE

Keeps Plant in Full Operation and Reduces Oil Consumption 50%

Cold-rolling threads on cold-headed bolts is a tough operation, and a mighty big financial headache, if the thread-roller does not receive proper lubrication.

Such a condition developed in the plant of a well-known manufacturer of screw machine products. Oil ran out of bearings and would not adhere to the guides for the reciprocating die holder. On several occasions the main bearings overheated and seized up. In each instance four days' downtime resulted, costing a large amount for labor and 30 percent in bolt production. Furthermore, the oil loss became so excessive that maintenance crews actually had to put in extra work to keep floors clean and safe.

In his search for a solution to the problem, this manufacturer called in a Sun representative, who induced him to try Suntac Oil. In the 18 months which have elapsed, there have been no production losses attributable to inadequate lubrication, downtime has been eliminated, and cleanups have been reduced to a routine minimum. The consumption of oil has been cut in half. Savings on oil and maintenance have amounted to more than $3,000.

Suntac Oils are recommended for general lubrication in all machinery where retention of oil in bearings is a problem. These "Job Proved" products cling to the parts to be lubricated. For further information, call or write your nearest Sun Office.

SUN OIL COMPANY • *Philadelphia 3, Pa.*
In Canada: Sun Oil Company, Ltd.
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"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

For the third time in four years we are expanding our facilities . . . expanding with a purpose . . . to supply critical forgings for the rearmament program and at the same time continue to serve our valued customers in industry.

We have acquired the complete facilities of the Melvindale, Mich., forge plant of the Ordnance Tank-Automotive Center . . . 148,000 square feet of modern upset and drop forging equipment. This plant will be devoted to making forged parts for Army Ordnance . . . parts vital in America's defense.

This third step in our expansion follows the purchase in 1948 of a complete forge plant in Cicero and the acquisition in 1949 of A. C. Woods & Co. of Rockford . . . a plant devoted to the manufacture of structural and welded steel products.

"America's Number One Forge Plant" with its greatly increased facilities is now better equipped than ever before to supply your flat die, drop and upset forging needs. Your inquiries are invited.

KROPP FORGE COMPANY
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gear finishing machines are provided with the familiar Barnesdril magnetic separator to assure freedom from chips and dirt that might mar surface finish.

The ring gear for this drive is made from steel tubing. It has a nominal outside diameter of six in. over the external parking brake teeth, and an internal helical gear with 66 teeth and normal pitch of 14. Normal pressure angle is 20 deg while the helix angle is 20 deg RH. After considerable experimental work, Warner Gear adopted broaching as the method for producing the internal gear. This is done in two stages, the first operation being handled in an enormous 30-ton American broach of double ram type, handling two rings at a time for the roughing operation. The external teeth are cut later in one of the Michigan Tool Shear-Cut machines.

After roughing and turning, the part is given a stress-relief treatment, followed by corrective turning and finishing operations. The last stage, prior to heat treatment is the finish-broaching of internal gear teeth. This is done in a smaller American broach.

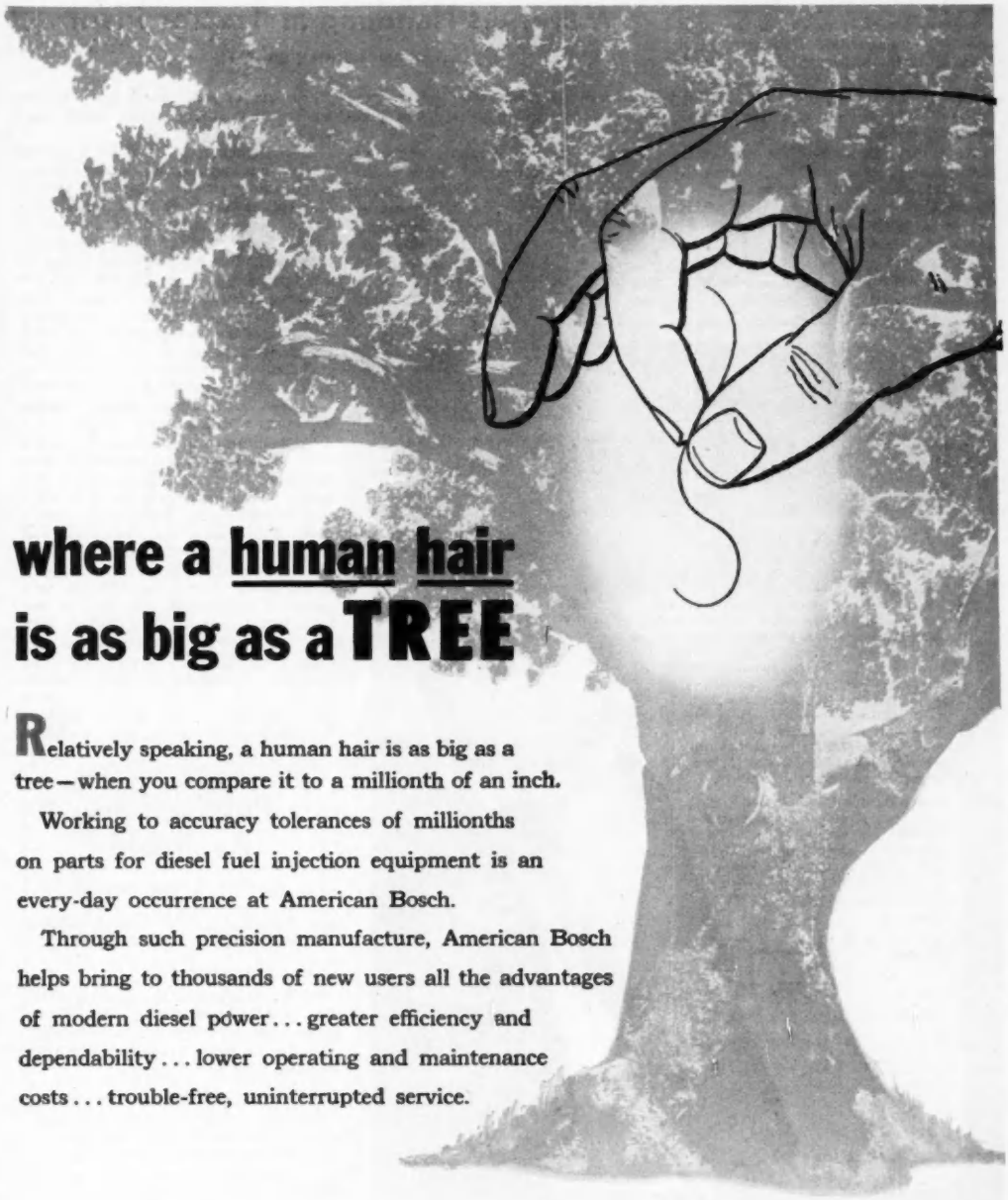
Some brief comment may be made on the facilities for final assembly. Final assembly is done in a large self-contained room which is air-conditioned and temperature controlled. It is logically departmentalized to facilitate the integration of sub-assemblies such as the case. This permits the testing of individual sub-assemblies such as clutches, pumps, etc., for acceptance before they go to the assembly conveyor. In addition, all component parts that carry pressure lines are checked individually for leakage before being OK'ed for assembly.

From the individual sub-assembly stations the various parts are then routed to the start of the power conveyor on which the complete assembly begins to be integrated. As the assembly is completed, it is suspended on the monorail feeder conveyor and transported to a separate section of the assembly department for testing. Here there is a battery of six test stands, equipped with suitable pressure gages and tachometers designed to facilitate a complete routine of all maneuvers specified by the customers. It is of interest that all of the oil used for testing is of special specification quality, supplied to the test stands at a minimum temperature of 230 F. At this temperature the fluid has the same viscosity as does the specification service fluid at transmission operating temperatures.

After testing, the units are placed on a merry-go-round conveyor to permit sufficient time for draining the fluid. Then they are removed from this conveyor and placed on a gravity roller conveyor to facilitate installation of plumbing, and completion of finishing operations, ready for painting and delivery to the customer.

For reasons of expediency, as well as practical considerations, valve body

(*Turn to page* 104, *please*)



where a human hair is as big as a TREE

Relatively speaking, a human hair is as big as a tree—when you compare it to a millionth of an inch.

Working to accuracy tolerances of millionths on parts for diesel fuel injection equipment is an every-day occurrence at American Bosch.

Through such precision manufacture, American Bosch helps bring to thousands of new users all the advantages of modern diesel power... greater efficiency and dependability... lower operating and maintenance costs... trouble-free, uninterrupted service.

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ELECTRIC WINDSHIELD WIPERS • DIESEL FUEL INJECTION EQUIPMENT

AMERICAN BOSCH CORPORATION • SPRINGFIELD 7, MASS.

assembly is housed in a separate air-conditioned room away from the main assembly department. This affords an isolated location for the more painstaking job of producing the critical assembly, selective fitting, and testing without interfering with the major assembly operation.

As the valve assemblies are completed, they are tested 100 per cent in a special machine designed to check all of the operating features. Here oil is fed at a temperature 115 to 125 F. Some impression of the extent of the test procedure may be gained from the fact that the routine requires a battery of 12 gages.

Materials Handling at Tractor Plant

(*Continued from page* 41)

a central station, thus eliminating back-tracking and duplication of pick-ups and deliveries.

Another feature of inter-plant movement of materials is the use of a narrow-gage rail line on which as many as ten small cars are hauled by a four-wheeled, rubber-tired industrial tractor.

One of the most recent developments is the introduction of palletizing for all manner of loads, coupled with the adoption of standardized steel containers. These are of self-tiering hairpin type, easily and safely tiered with fork trucks.

Because most of the older buildings do not have aisles wide enough to accommodate power industrial trucks, Caterpillar has installed a large number of power hand trucks as well as power hand stackers, the latter being invaluable in crowded areas where it becomes necessary to lift the load. In addition, a large fleet of industrial fork trucks is employed for transporting loads from machining areas and welding lines to assembly lines. Similarly, trainloads of materials are unloaded by means of power fork trucks for storing, then delivered to points of usage by means of power hand trucks.

To facilitate the maintenance of the large fleet of industrial trucks and automotive equipment, the company recently placed in operation a new building known as the Automotive Repair Shop. Comprising over 20,000 sq ft of floor area, this plant is fully equipped with modern facilities for repair and maintenance operations. Thus a program of preventive maintenance has been established, in combination with four local service stations on the factory grounds. Regular inspection, washing, lubrication, and minor adjustments at the right time keep the entire fleet running in good shape without hazard to break-down, and at lower overall cost.

Highest Precision

HARDENED & GROUND PARTS

THE ball stud shown here is a perfect example of the precision methods and quality material that go into the production of all Brown Hardened and Ground Parts. Twelve separate operations are employed to produce this vital part. Every feature about this ball stud *has* to be right—every feature *is*. It has strength, wear resistance, precision fit, true-ground spherical and tapered surfaces, close inspection and strict uniformity.

Brown Hardened and Ground Parts have been serving the automotive industry for over 40 years. We refer you to any of our long list of satisfied customers. For information pertaining to your own requirements, simply write or wire.

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Parts Include
King Pins
Shackle Bolts
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Stub Axle Shafts
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Wheel Studs
Water Pump Shafts
anything in the hardened and ground line, of any analysis steel, up to 4" diameter.

THE BROWN CORP.

213 BELLEVUE AVE. SYRACUSE, N. Y.

Publications Available

(*Continued from page* 56)

new SutecRod 148FC, bronze welding rod for cast and malleable iron welds.

D-30 Conveyors

E. W. Buschman Co.—A comprehensive new 16-page catalog, No. 60, on roller conveyors shows a wide variety of roller conveyor types together with selection data and diagrams.

D-31 Pyrometers

Wheelco Instruments Co.—Two portable pyrometers, Models 4 and 2865, are described in bulletin PPY-1.

D-32 Solder

Federated Metals Div., American Smelting and Refining Co.—An educational 36-page brochure on the nature, properties, and uses of solder is being offered.

D-33 Heat Treat Equipment

Mahr Manufacturing Co., Div. of Diamond Iron Works—Release of a four page bulletin, NX-1, cataloging a specialized line of heat treating equipment, has been announced.

Now another new Fuller ROADRANGER plus Overdrive!

gives you all this...

- 10 speeds forward and 2 reverse
- No gear splitting—10 selective gear ratios evenly and progressively spaced
- Easier, quicker shifts—only 28% steps
- One shift lever controls all 10 forward speeds
- Higher average road speed
- Engine operates in peak hp range for top fuel economy
- Less driver fatigue with ⅓ less shifting
- Range shifts pre-selected—automatic and synchronized

Designed for heavy (150-300 hp engines) over-the-highway hauling where severe conditions are encountered, the Fuller "one-lever-controls-10-speeds" ROADRANGER has been a sensation since its introduction.

Now, the addition of an overdrive ratio makes for even more flexible operation . . . increases ROADRANGER versatility, economy, driver acceptance.

You get these gear ratios: *LOW RANGE:* 1st, 7.45; 2nd, 5.82; 3rd, 4.49; 4th, 3.55; 5th, 2.76. *HIGH RANGE:* 6th, 2.10; 7th, 1.64: 8th, 1.27; 9th, 1.00 and *OVERDRIVE,* 0.779! (Husky reverse of 9.89 in low range; 2.78 in high range.) Clutch housing sizes—SAE No. 1 or No. 2.

The R-950-C weighs only 804 pounds with standard controls. It features all helical gearing for higher capacity with lower weight than conventional transmission development—the Model R-950-C Fuller ROADRANGER—10 speeds forward with *overdrive.*

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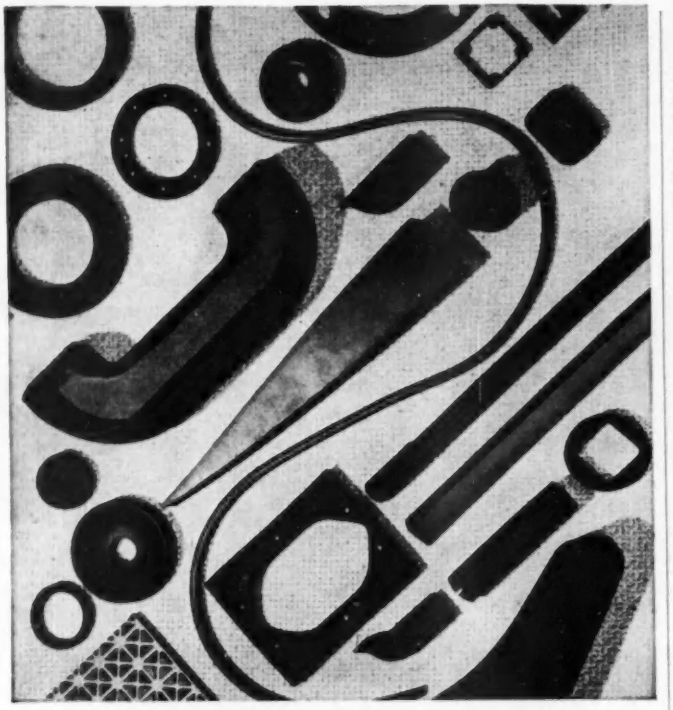

HOW INDUSTRY IS USING RUBATEX CLOSED CELL RUBBER

Product engineers in industries have found RUBATEX Closed Cell Rubber the ideal material for uses such as these:

Gaskets
Automobile arm rests
Anti-squeak pads
Dust barriers
Low temperature insulation
Packing cushion for fragile goods
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Arctic equipment
Shoe innersoles
Typewriter cushions
Rug underpad
Seat cushions
Bath and kitchen mats
Crib and play-pen mats
Weather stripping
Vibration damping

RUBATEX is light in weight, buoyant, and has good compressive strength. It cannot absorb moisture even at cut edges. RUBATEX is rot and vermin proof and sanitary. There is a big economy factor to RUBATEX. Most gasket requirements can be cut from sheet stock without need for the expense of a molded-on skin. RUBATEX is available in natural and synthetic stocks and in soft, medium and firm forms. For more information, write for Catalog, RBS-12-49, Great American Industries, Inc., RUBATEX DIVISION, BEDFORD, VIRGINIA.

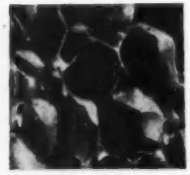


Photo-micrograph of RUBATEX closed cellular rubber shows the tiny individually sealed balloon-like chambers which retain inert nitrogen under pressure.

RUBATEX

CLOSED CELL RUBBER

ZERO MOISTURE ABSORPTION

RESILIENT AT LOW TEMPERATURES

EXCELLENT SHOCK ABSORPTION

Paris Aviation Show

(*Continued from page* 45)

which recently crossed the Atlantic in four hours, 37 minutes; and four engines are now being installed in one of the Comet airliners. Production stage of the Avon has been reached, and in addition to building it in its own factory at Derby and in a new factory at Glasgow, both the Bristol and the Napier companies are tooling up for it.

Output of the turboprop Dart has been pushed up to 1400 hp, and this powerplant has been accepted for the Vickers-Viscount 700 plane now under construction for the British European Airways Corp.

Four Avons are used on the Vickers-Armstrong Type 660 bomber, being buried in the inboard wing sections. This bomber, which is intended to replace the Lincoln and the B-29, in the British service was represented on the stand by nothing more than a photograph and only vague information has been given out regarding it.

Hispano-Suiza, holding a license for the construction of Rolls-Royce jet engines in France, has experimented for some time on after-burners and has now completed a system, which was shown on the Nene, by which the after-burner can be put into operation by the use of a single push button, with a resultant 30 per cent power boost. The after-burner has been used on a Languedoc 161 and is expected to undergo its official endurance tests very shortly. In addition to the Nene, which has been in production since 1947, Hispano-Suiza is tooling up to produce the Tay.

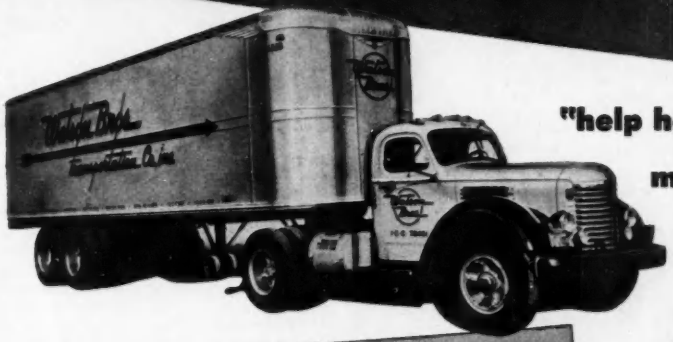
Armstrong - Siddeley showed the Sapphire and the Double Mamba, the former, with a 12,000 lb thrust at 600 mph, and which has been type tested for 150 hours at 7200 lb, claims to be the world's most powerful jet engine. It is to be manufactured in the United States, but only general information is issued regarding it. The Sapphire engine was described and illustrated in AUTOMOTIVE INDUSTRIES, Oct. 1, 1950.

Bristol also displayed a double power unit, the Coupled Proteus, designed for buried installations, where the small diameter gives it an advantage. This powerplant has been specified for the largest two British civil aircraft; the Saunders-Roe flying boat and the production version of the Bristol Brabazon. The latest of the Bristol productions is the Olympus turbojet, at present completely secret.

Outstanding of the French turbojets is the Atar 101, built in the nationalized shops of the S.N.E.C.M.A., these formerly being a part of the Gnome & Rhone organizations. Several versions of this machine are planned, the first of which underwent its official tests early in the year. It develops a thrust of 5300 lb at sea level. A second series is intended to have a thrust of 6170 lb, another with water injection will

(*Turn to page* 108, *please*)

Wagner Air Brakes



"help hold our maintenance to an absolute minimum in our more than *30,000,000* miles a year operation"

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"Every Twenty-four Hours"

"Twice around the World"

October 3, 1950.

Wagner Electric Corporation
715 North 17th Street
Omaha, Nebraska

Gentlemen:

I am happy to advise that our company has been a user of Wagner Air Brake equipment for many years.

We have found your equipment to be of the highest quality. We particularly want to mention the very efficient operation of your rotary compressor.

In a business like ours, operating in excess of thirty million miles a year from Chicago, Illinois to Los Angeles, California and from Minneapolis-St. Paul, Minnesota to St. Louis, Missouri on daily schedules, it is essential to hold our maintenance cost to an absolute minimum.

We have found that your Wagner rotary compressors require a minimum of maintenance and have played a large part in reducing our over-all maintenance cost.

Yours very truly,
WATSON BROS. TRANSPORTATION CO., INC.

MARK S. BORLAND, Purchasing Agent

MSB:er

Safe, trouble-free, dependable brakes are an all-important consideration in the profitable operation of over-the-road fleets. Today, loads are heavier . . . runs are longer . . . and competition is keener. Vehicles "laid up" for repairs because of accidents caused by faulty brakes mean lost revenue. Be sure of your brakes—install Wagner Air Brakes and you will find your brake maintenance costs going down and your payload profits going up.

Thousands of heavy-duty vehicles equipped with Wagner Air Brakes safely travel many millions of miles each year. Give the vehicles you manufacture real brake economy by including Wagner Air Brakes—the only system with the Rotary Air Compressor . . . as standard equipment.

Wagner Air Brake Users are our Biggest Boosters.

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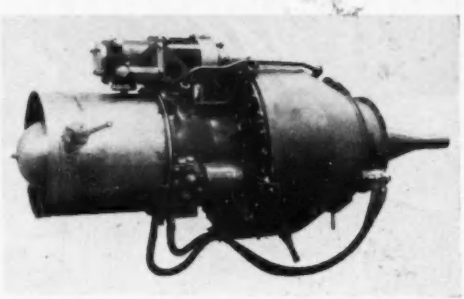
Wagner AIR BRAKES
The Only System with The Rotary Air Compressor

K51-15A

reach 7300 lb and with after-burner the output will be 8800 lb. The Aatar is an axial-type jet turbine having a diameter of 35 in. and an overall length of 111 in. Weight without starting mechanism is about 1980 lb.

The T.B. 1000 by the same company is a turboprop machine which has not yet reached the production stage. It is characterized by a nine-stage axial compressor, six combustion chambers, a two-stage turbine and a reduction gear This machine will have the equivalent of 2000 hp. Its diameter is 27.5 in. and length about 108 in. Weight without propeller is 1050 lb. The



The Palas jet turbine, made by Turbomeca, develops 330 lb thrust at take-off; 260 lb maximum for continuous operation.

S.N.E.C.M.A. is now building the Bristol radial Hercules piston engine.

Small gas turbines and jet engines were exhibited by Turbomeca and figured on a number of airplane manufacturers' stands. The gas turbines were of two models, the Oredon of 160 hp maximum, or 140 in continuous service, and the Artouste of 275 hp maintaining 230 hp in continuous service. The dimensions of the former are only 35 by 13.7 by 20 in. This firm produces three types of jet engines, the Pimene with 220 lb thrust at take-off, the Palas with 330 lb thrust, and two versions of the Marbore with respectively 660 and 835 lb thrust. In addition there were two other jet engines, the Aspin I and the Aspin II. The former which has undergone a 1000 hour test, gives a maximum thrust of 440 lb, and the latter which is under construction is expected to give a maximum of 730 lb thrust.

The Fouga Co. showed the Lutin, a competition plane, propelled by two Turbomeca Palas jet engines mounted under the wings, each engine giving a maximum thrust of 330 lb and weighing 147 lb without electric starting gear. This machine has a speed rather better than 300 mph. Working in conjunction with the Nationalized Aviation Co. of the South-West, the Turbomeca Co. is fitting the Palas jet as an auxiliary to the Douglas DC 3, the mounting under the fuselage being possible without any structural alteration on the plane. A machine with this auxiliary jet engine was shown in flight at Le Bourget. In addition, arrangements are being made to fit the Bretagne SO 30 with an auxiliary jet engine. There are two versions of this machine, one with Pratt & Whitney 2030 hp engines, and the other with Pratt & Whitney CA 18 of 2485 hp.

Italian aeronautical activity was largely represented by Fiat, which firm holds the license for the construction of the De Havilland Ghost and the Vampire planes, and also for Hamilton propellers. Since the end of the war Fiat aviation activities have been considerably developed, the company having passed from the maintenance and repair stage of Pratt & Whitney, Rolls-Royce and Packard engines, to the construction of new engines, planes and

(*Turn to page* 112, *please*)

GENERATORS
CRANKING MOTORS
CARRIES THE LOAD!
Leece-Neville quality electrical equipment is manufactured in a wide range of capacities... to carry any load. Leece-Neville continues to engineer and build units to your special requirements. L-N heavy-duty equipment includes:
GENERATORS from 60 to 2,000 watts, for 12-volt standard systems and 12-24 volt series-parallel systems. Shown above: 14 volt, 40 ampere, low cut-in Generator.
CRANKING MOTORS from ½ H.P. to 27 H.P. Illustrated is motor for 12 volt and 12-24 volt systems.
VOLTAGE REGULATORS of rugged construction for heavy duty service.
SWITCHES, hand and magnetic, for standard 12 volt systems and for 12-24 volt series parallel systems.
For complete information, just write The Leece-Neville Co., Cleveland 14, Ohio.
Pioneer and STILL Quality Leader
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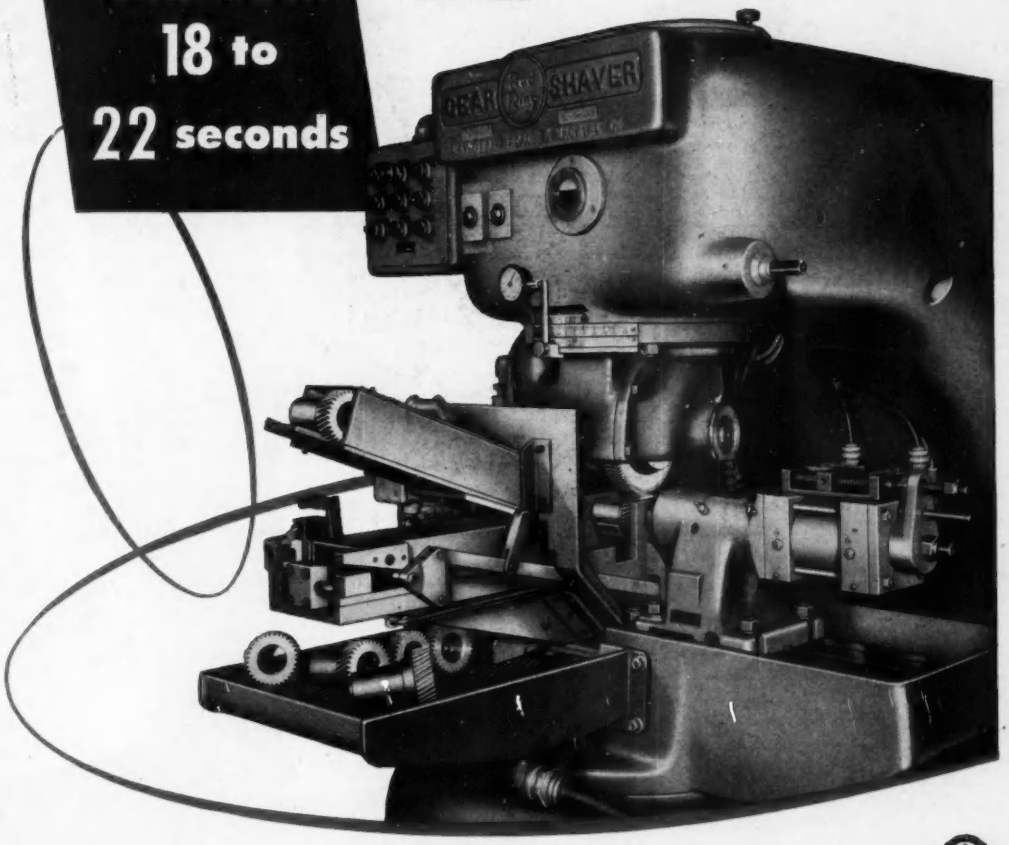
Transmission Gears

shaved in 18 to 22 seconds

The gear on this automatic transmission reverse drive sleeve is 2⅝" in diameter with a ⅞" face, 33 teeth and 14 normal D.P.

It is being shaved on this Red Ring Diagonal Gear Shaving Machine equipped for fully automatic loading at a rate of from 165 to 200 per hour, removing .0025" to .0015" of stock on tooth thickness. Rates up to 300 per hour have been recorded on smaller automotive transmission gears.

Automatic loading gives you not only the highest production rates, but it also minimizes operator fatigue and assures extremely close tolerance gears with ordinary machine operators—no special skill is needed.



WRITE FOR DESCRIPTIVE LITERATURE ON RED RING GEAR SHAVING AND AUTOMATIC LOADING

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

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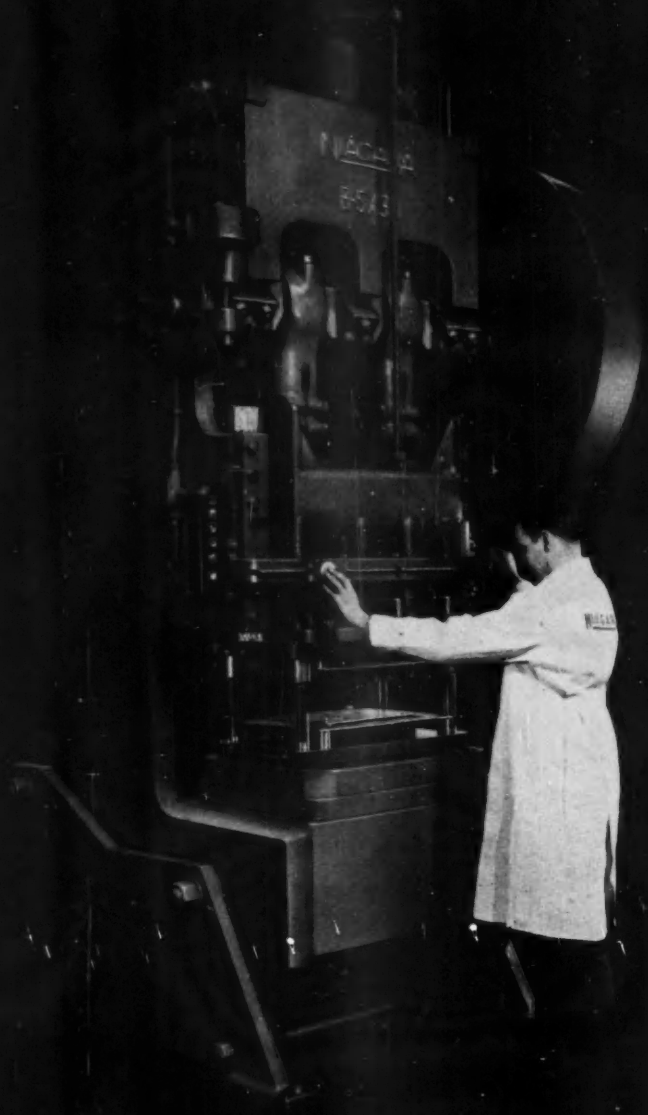


for Defense Production

Niagara No. BI-5x30 Gap Frame Double Crank Inclinable Press fitted with magnetic perforating dies made by S. B. Whistler & Sons, Inc., Buffalo, N. Y. Press equipped with air actuated electrically controlled sleeve clutch.

Write for Specifications

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

PRESENTS The NEW

No. BI-5x30 Double Crank Inclinable Press

Gap Frame with one-piece welded steel frame

- Gives full support to wide dies, impossible to obtain on the conventional single point Inclinable Press even with slide flanged out.
- Gibbing may be brought closer to point of load application on this double crank press than with flanged slide single crank design.
- Two point suspension resists tendency of slide to tilt under off-center loading conditions.
- Niagara gap frame construction gives equal access to all four sides of die. No ribs or shafts extending across the back of press.
- Inclined position permits finished work to drop off the rear of the press.
- Gearing enclosed and running in oil.
- Backshaft mounted on anti-friction bearings.
- Air counterbalance for slide.
- Bronze bushed main and connection bearings.
- Niagara electrically controlled air actuated sleeve clutch.
- Air releasing brake.

Similar presses are made in sizes ranging from 3½" to 6½" diameter shaft. Sizes 3½" and 4" are made with mechanically operated sleeve clutch.

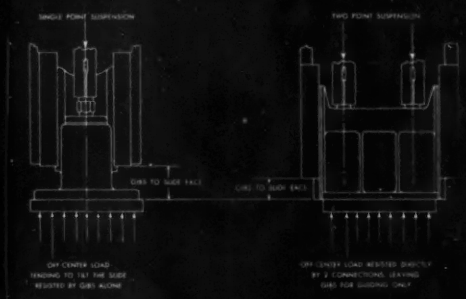
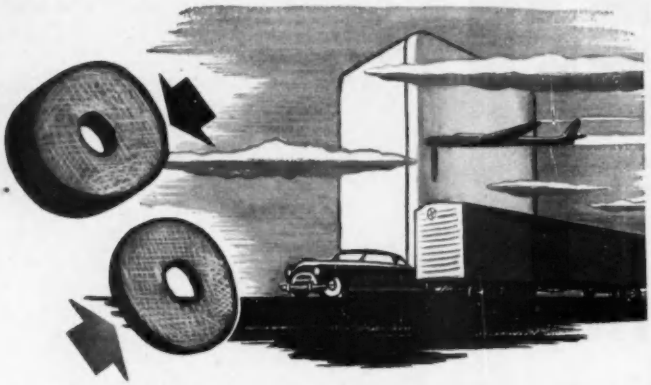

SINGLE POINT SUSPENSION
TWO POINT SUSPENSION
GIBS TO SLIDE FACE
GIBS TO SLIDE EACH
OFF-CENTER LOAD TENDING TO TILT THE SLIDE RESISTED BY GIBS ALONE
OFF-CENTER LOAD RESISTED DIRECTLY BY 2 CONNECTIONS, LEAVING GIBS FOR GUIDING ONLY

Illustration shows Niagara No. BI-5x30 press in inclined position.

Manufacturers of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK



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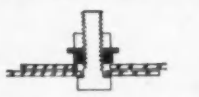
SEALING WASHERS

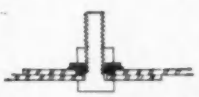
Here's a product that should find hundreds of uses in American industry—a washer that not only seals out dirt, dust, water and water-vapor but also helps to eliminate squeaks and rattles.

A product of PRESSTITE ENGINEERING COMPANY, these newly developed sealers fulfill a need for a simple easy, yet effective method of sealing bolts, screws and other parts.

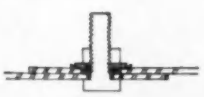
The washers are made of a fabricated compound in standard sizes. They have strong adherence to faying surfaces, and can be supplied from materials that are resistant to gasoline or oil and other properties.



Illustrates the method of installing PRESSTITE Sealing Washers. The washer is placed on the bolt.



As the torque on the bolt is increased the Sealer is forced into the annular space between bolt and the rim of the hole, affecting a water tight seal.



Completed installation. The bolt has been tightened to the required pressure. The material has been forced out around the edge of the lock washer giving a complete seal.

SEALING COMPOUNDS BY PRESSTITE

For complete information about these new sealers . . . or for helpful assistance in solving other sealing problems, write today or contact one of our representatives.

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accessories. A very modern test bench for jet engines has been constructed in the neighborhood of Turin, and a model of this was presented at the show.

Most important of the Fiat productions, for which engineer Giuseppe Gabrielli is responsible, is the G.80/1 and G.80/2 jet plane equipped with either the Gobelin 35 or the Rolls-Royce Nene. The latter has a maximum speed of 570 mph and a ceiling of 49,000 ft. Both planes are low-wing, all-metal construction, with a monocoque fuselage in three sections, a pressurized cabin, a tricycle landing gear and hydraulic brakes. Intended for training, this plane is made both as a single and a tandem two-seater. The range of Fiat planes goes from the small touring machine up to freighters and 36 passenger planes, these latter being equipped with three Pratt & Whitney engines.

French engine construction is turning more and more toward straight jet and turboprop powerplants, two types being produced by the nationalized factory, the S.N.E.C.M.A., and Rolls-Royce models by Hispano-Suiza. The only important piston engine built by the S.N.E.C.M.A. is the Hercules replacing the 14-R. Smaller engines are an inverted aircooled 12 and an inverted aircooled four of 145 hp. Hispano-Suiza is producing the 12 cylinder of 1000 hp at maximum cruising speed, but more emphasis is being placed on the jet types.

Most of the activity in piston engines is in small and medium powers as shown by Potez, Victor Minié, Lutetia, etc. This last mentioned firm has a double-six radial, two-stroke engine which apparently has not yet reached the production stage.

Both from a military and a commercial angle, France is still very largely dependent on British and American aid. Among the all-French machines prominence was given to the Nord-2500, a military or civil freighter equipped with two Bristol Hercules engines in the forward edge of the two booms. This plane has a cargo capacity of more than 1800 cu ft, weighs 43,000 lb with full load, and has a cruising speed of 200 mph. Breguet produces the same class of machine with the Two Decker made in two versions, one for carrying 106 to 130 passengers, and the other as a 15-ton freighter. Both have four Pratt & Whitney engines of 2135 hp each. Breguet also has the 970 Fulgor in preparation, with either four Double-Mamba turbo-props, or four Tay of Atar jet engines.

The Armagnac SE 2010, manufactured by the South-West nationalized company, and intended originally for Atlantic service, has been outstripped by American machines, and will be supplemented by the Super-Armagnac fitted with turbojet engines. At present the Armagnac is fitted with four Pratt & Whitney R 4360 engines, and has a passenger carrying capacity varying

(*Turn to page* 114, *please*)

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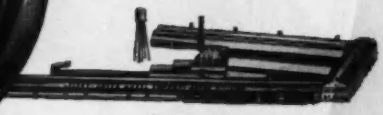

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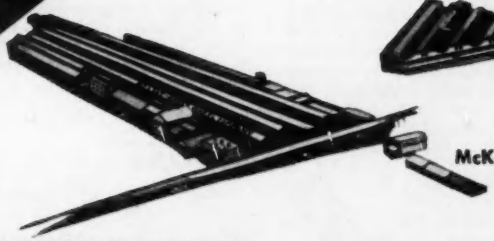

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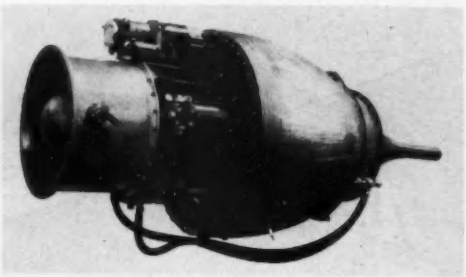
from 84 to 107, or up to 160 for short-distance flights.

The same company is working on the SO 5100 Champagne, a low-wing monoplane which will be fitted with four buried jet engines—Nene, Tay or Atar—and will have a capacity of 55 to 60 passengers. The useful loads will be five to 10 tons for distances of 900 to 2000 miles, with speeds of 450 to 490 mph. The cabin will be pressurized up to 40,000 ft.

Prominent among the French twin engine passenger planes is the S.O. 30.P Bretagne now in regular service on French Union lines, either with 2000 hp Pratt & Whitney engines, or with the 2400 model. Here again the tendency towards the jet engine is revealed, for the SO 30 Nene is a modification of the Bretagne with two Nene jets. This plane is still in the experimental stage.



This Marbore jet engine develops 835 lb thrust at take-off. It is the larger of two Marbore models made by Turbomeca.

Helicopters occupied an important position in the show, but practically all of them were well-known types—Sikorsky, Bristol, Cierva (Saunders-Roe) etc. An original type, which has been flown but has not yet passed beyond the experimental stage, was the S.O. 1120 Ariel III. This machine has a three-blade rotor and its power is obtained from a Turbomeca Artouste gas turbine of 275 hp, mounted in the cabin immediately behind the passenger seats, with direct drive to a compressor. Compressed air is fed through the hollow blades to combustion chambers on the rotor tips, fuel being injected and fired electrically by a magneto. Begun in 1947, it is claimed that this is the first application of the reaction engine to a helicopter. The Ariel III has a rotor diameter of 33 ft, weighs 1490 lb empty, carries a useful load of 1250 lb, has a maximum speed of 90 mph, and a practical ceiling of 14,000 ft. Another model now being developed has a group of turbines which will operate a reaction rotor for helicopter flight and propellers for horizontal flight.

Leading American participants in the Paris show were United Aircraft Corp., Douglas, Bendix, Aerojet, Department of Commerce Civil Aeronautic Administration, etc.

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STANDARD METAL DIRECTORY, published by the *Atlas Publishing Co., Inc., 485 West 25th Street, New York, N. Y.* Price $15. The new directory is divided into five sections embracing: iron and steel plants; ferrous and nonferrous metal foundries; metal rolling mills; metal rolling plants, and smelters of nonferrous metals. It contains more than 10,000 detailed reports on steel mills, foundries, smelters, rolling mills and nonferrous metal plants, that are located in the United States and Canada. The plants are listed geographically and alphabetically. The reports give the name of the company, its capitalization, plant equipment, products manufactured, primary and secondary raw materials consumed, names of the company's officers, purchasing agent and sales manager.

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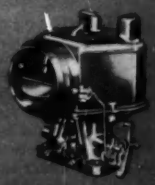

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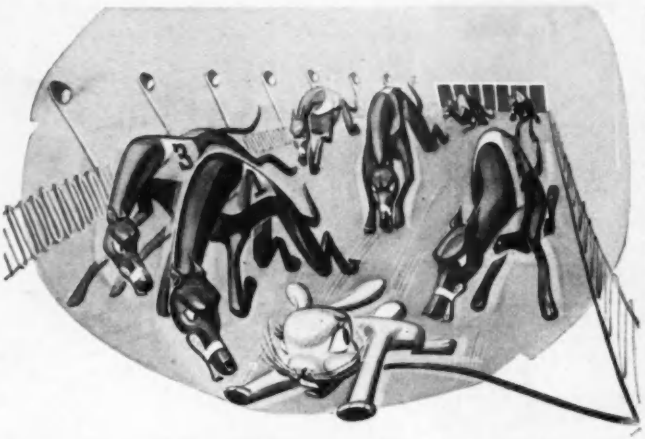

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AIRBRIEFS

(*Continued from page* 58)

Bugs vs Missiles

Very often we lax into the giddiness of supersonic intercontinental missile thinking and readily predict the moon and back in only a question of days. It is invariably when we are in such an intoxicating mental atmosphere that we are brought down hard by some of the nuts and bolts truths of the matter.

The other day we were chatting with able Mel Gough, pioneer research pilot and for many years chief of the NACA Langley laboratory flight test division, who quietly pointed out that 99 per cent of their scientific flight difficulties on late-model jet fighters and high-speed research aircraft was not Mach number effects or compressibility tail buffet but accessory and equipment difficulties, which keep these sleek speedsters grounded much more often than do the mysteries of transonic aerodynamics.

Checking this theory with a test pilot at Edwards Air Force Base, Muroc, Calif., where such exciting new aircraft as the Lockheed XF-90, Republic XF-91 and the rakish Delta-wing Convair XF-92A are undergoing test, we got the same answer: its the bits and pieces that give all the trouble, pumps and motors, control valves and actuators, relays and shunts.

Gallup Was Right

Apparently the only trouble with polls is that they don't reflect the thinking of the people interviewed. The Civil Aeronautics Administration polled about everybody on its mailing list several years ago to determine specifications for the ideal crop-dusting and spraying airplane to replace the war-weary Boeing biplanes used widely for the purpose. The answers came back thick and fast, tabualtions were made, statistics computed and the final requirements for the airplane determined. Veteran designer Fred Weick produced this ideal airplane in his laboratory at Texas A&M College and it is now on a nation-wide tour of CAA regional headquarters for examination by CAA and private experts and operators. So far the most oft-repeated comment on the new airplane is: "Well, it's a good one but it shore don't do the job like the Boeing biplane."

A similar story is being told by Air Associates, who polled literally thousands of civil pilots on the desirability of shoulder harnesses in personal aircraft and the questionnaire even contained blanks covering price and design preference in such a harness. The answers came back with an overwhelming majority certifying their enormous interest in shoulder harnesses for personal aircraft. Thus encouraged, Air Associates produced such a harness and prepared for the landslide of orders. The result: a few desultory sales and a bleak outlook for use of the shoulder harness in personal aircraft.

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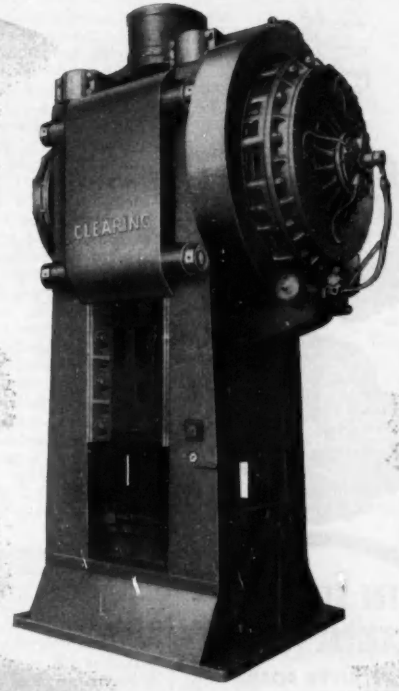

Faster production in forging or cold coining operations, using less skilled labor yet holding ever closer tolerances in output—that's what manufacturers for defense or civilian needs are demanding today. Clearing meets those demands—all of them—with its new Series EF presses, which incorporate many improvements over previous Clearing forging presses.

Short-travel disc clutch and brake act faster to speed operation. Offset eccentric allows continuous guiding of extra long slide to assure maximum precision. Coordinated knockouts minimize contact time to keep dies cooler, longer lasting.

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CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

CMC CLEARING

Analysis of Jet Eng ne Exhaust Gas

(*Continued from page 60*)

tion process thus has a direct bearing on the over-all efficiency of the engine. While combustion efficiency can be calculated from observations of the temperatures and rates of flow of air, exhaust gas, and fuel, it is often difficult or impossible to make sufficiently accurate measurements of these quantities. The common methods of gas analysis have also proved unsatisfactory for this purpose because the fuel is burned with so much excess air that the concentration of the products of combustion is very low. To provide a more effective means for studying jet combustion efficiency, NBS therefore undertook to develop a reliable method of exhaust gas analysis. Since analysis by weight gives precise results for small quantities, gravimetric methods were applied to the problem.

The NBS method aims primarily to determine the efficiency of the combustion process rather than to identify all constituents. Essentially, it involves, first, the determination of the products of complete combustion, namely water and carbon dioxide, initially present in the sample, and second, determination of water and carbon dioxide obtained by oxidizing any combustibles remaining in the sample. All of the water and carbon dioxide initially present in the partially burned exhaust gas are first removed separately by absorption on solid reagents. The combustibles remaining in the gas are then burned completely in a quartz combustion tube, and the water and carbon dioxide thus formed are selectively absorbed as before. From the weights of carbon dioxide and water collected before and after complete combustion, the combustion efficiency of the jet engine can be calculated.

The sample of exhaust gas is first passed through a cold trap kept at —78 C, then through two absorption bottles containing drierite and ascarite respectively, where water and carbon dioxide are absorbed. Hydrocarbons, which would otherwise be adsorbed on the surface of the reagents used to absorb water and carbon dioxide, are condensed and remain in the cold trap. The remaining gases enter a quartz combustion tube containing copper oxide at 1000 C. Here combustibles such as carbon monoxide, hydrogen, and methane are oxidized to water and carbon dioxide, which are collected in absorption bottles containing anhydrone and ascarite. The condensate in the cold trap is then volatilized by gentle heating and flushed into the combustion tube by a stream of dry, carbon dioxide-free air. After complete combustion of these fuels, the resulting water and carbon dioxide are collected as before. The weights of water and carbon dioxide collected both before and after the combustion are obtained separately. In addition, a small portion of the sample is analyzed for its carbon monoxide content by use of the NBS carbon monoxide indicator.

The combustion efficiency is computed from the equation

$$\eta_b = 1 - \frac{W_1 + 1.50\ W_2}{W_3 + 1.50\ W_4}$$

where η_b is the combustion efficiency, W_1 is the weight of carbon dioxide determined by combustion of the combustibles in the exhaust, W_2 is the weight of water obtained from the unburned material, W_3 is the sum of the weights of carbon dioxide originally in the sample and that obtained from the combustibles, and W_4 is the weight of water originally in the sample plus the weight of water from the unburned material. While W_1, W_2, and W_3 are experimental values, W_4 is calculated

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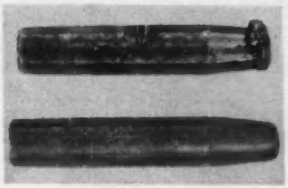
from the total weight of carbon dioixde collected in the absorption bottles. Before substitution in the equation, W_1 is corrected for the carbon monoxide found to be present in the sample.

In studies of the method at NBS, several samples of known composition, containing substances typical of actual exhaust gas, were prepared and analyzed. Agreement between combustion efficiency calculated from the known composition and from the analytical data was excellent. In fact, in one large series of analyses, the combustion efficiency calculated from the analytical data agreed within one per cent with that obtained from heat and flow measurements of the actual combustion chamber.

Electrode Tipping Technique

As a means of conserving copper while still providing customers with dependable spot welding electrodes, P. R. Mallory & Co., Inc. of Indianapolis, Ind., has developed a program for the conservation of spot welding electrodes.

Mallory research engineers have developed a unique process for brazing onto a used electrode shank a new nose of the same class of material. The "Nu-Tip" process employs a special Mallory silver solder which provides a bond of high melting point, high strength and low electrical resistance. Loss of electrode hardness due to brazing is said to be held within an unusually low limit.



Unserviceable, mushroomed electrode and the same electrode shank after application of Mallory "Nu-Tip" nose.

Mallory reports that in comprehensive offset welding tests, "Nu-Tip" electrodes have run 30,000 welds and have withstood repeated applications of 2,000 lbs. of force at an angle of 30 deg. The "Nu-Tip" noses employ the Mallory fluted water hole for more effective cooling.

Although Mallory does not represent the "Nu-Tip" electrode to be the equivalent of a new unit, it is clear that the method does provide substantial service life for electrodes that would otherwise be scrapped.

Fuel Costs Cut $1300 per Year per Bus Using Propane

Interesting fuel cost figures concerning ACF-Brill transit buses operated by two large midwestern cities have recently been released.

One operation reports that its propane units are averaging 2.43 mpg which is as good as, or better than, its propane powered coaches. These are 44 passenger units operating in dense traffic. The operating company is paying eight cents per gal for propane and 16 cents per gal for gasoline exclusive of excise tax.

On the basis of these figures, the fuel cost for propane is 3.29 cents per mile. Using the same mileage per gallon with the gasoline coaches, the gasoline cost is 6.6 cents per mile—or a saving of 3.31 cents per mile in favor of propane. With 40,000 miles of operation per coach yearly, this saving is equivalent to $1300 per coach per year.

In the other city, which also operates 44 passenger coaches in heavy traffic, the propane and gasoline vehicles are getting about equal miles per gallon. This operation pays 12 cents per gal for propane and 18 cents per gal for gasoline. Cost per mile for fuel is 4.8 cents for propane versus 7.2 cents for gasoline.

In addition to the 2.4 cents per mile saving with propane, oil in the propane-powered equipment is changed every 10,000 miles—twice the distance at which it is changed in gasoline burning bus engines.

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- ★ Most compact engine in its horsepower range—overall length only 43"!
- ★ Faster acceleration — quick response results from short stroke, light flywheel, and 8-cylinder power impulses!
- ★ Good high-speed performance — large bore and short stroke provide ample valve area. Unique combustion chamber shape having ample quench area retards detonation!
- ★ Smoother running engine at all speeds — extra rigidity of short box-like crankcase and five large main bearings reduce vibration!
- ★ Long life—replaceable, wet cylinder sleeves wear well, are inexpensive to replace. Stellite valves and seats and positive-type rotators promote long valve life—chrome-plated top ring adds extra miles between overhaul.

So, for better performance and lower operating costs, be sure your new heavy-duty trucks are powered with a Le Roi H-540. The coupon below will bring you a new H-540 catalog and specification sheet. Send for them today.

Condensed H-540 Specifications

Number of cylinders	8
Bore and stroke, inches	4½ x 4¼
Displacement, cubic inches	540
Horsepower, rated at rpm	207/3000
Weight bare, lbs.	1250

....Tear out this coupon and mail TODAY!....

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1706 S. 68th Street, Milwaukee 14, Wisconsin

Please send me complete information on the "advanced design" features of your new H-540 engine for heavy-duty trucks.

Name ..... Position .....

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E-71

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As MANY a bus and truck maintenance man will tell you, the best stop on the road is the stop you get with brake blocks made by RAYBESTOS-MANHATTAN. These boys know that a safe, smooth stop is the only stop that satisfies drivers and passengers . . . maintains schedules . . . puts money in the till.

Long-wearing R/M brake blocks cost less per mile, too. In fact, R/M STOP-AND-GO products have demonstrated so many advantages that R/M has become the world's largest supplier of friction materials to the automotive industry . . . brake linings, brake blocks, clutch facings, and engineered automatic transmission parts.

Manufacturers in many other fields . . . from construction machinery to office equipment . . . place equal reliance on R/M friction material performance.

Whatever *your* friction material requirements, call in your R/M representative. He can work from samples, from designs on paper, or from figures on horsepower development combined with desired performance characteristics. Behind him stand all the facilities of four plants, four research departments, and four testing laboratories.

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RAYBESTOS-MANHATTAN, INC., Manufacturers of Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Mechanical Rubber Products • Rubber Covered Equipment • Packings • Asbestos Textiles Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

Protect Yourself for Renegotiation

(*Continued from page 33*)

association, or other reports whereby the end use of the products may be determined.

6. Spot checks of detailed transactions of part of the fiscal year and applying the percentages to the total sales for the year.

Factors in Determining Excessive Profits

Each individual contractor is judged on the basis of the merits of his own particular case. There is no industry base, formula or standard by which a company is measured. The Board recognizes that the factors for one company will not apply to the next one that may appear before them. Renegotiation proceedings must be tailored to fit the company under consideration.

To properly prepare a good brief for your company you must be able to stand off from the contractor and constructively view all the factors and prepare an analysis of the company which will permit the Board to make a competent determination fair both to the Government and the contractor. The current Military Renegotiation Regulations read as follows:

"In general reasonable profits should be determined by over-all evaluation of the particular factors present without limitation or restriction by any fixed formula with respect to rate of profit, or otherwise. Renegotiation proceedings should not result in a profit based on the principle of a percentage of cost. Contractors who sell at lower prices and produce at lower costs through good management, improved methods of production, close control of expenditures, and careful purchasing will receive a more favorable determination than those who do not. Such favorable or unfavorable determination will be reflected in the profits allowed to be retained by the contractor or sub-contractor as non-excessive. Claims of a contractor for favorable consideration *must be supported by established facts, analyses, and appropriate comparisons.*"

The factors to which the Board gives consideration in determining the excessive profits of contractors are:

1. Efficiency of the contractor with particular regard to attainment of quantity and quality production, reduction of costs, and economy in the use of materials, facilities and manpower.

2. Reasonableness of costs and profits, with particular regard to volume of production, normal earnings, and comparison of war and peacetime products.

3. Reasonableness of return on net worth with particular regard to the amount and source of public and private capital employed.

4. Extent of risk assumed, including the risk incident to reasonable pricing policies.

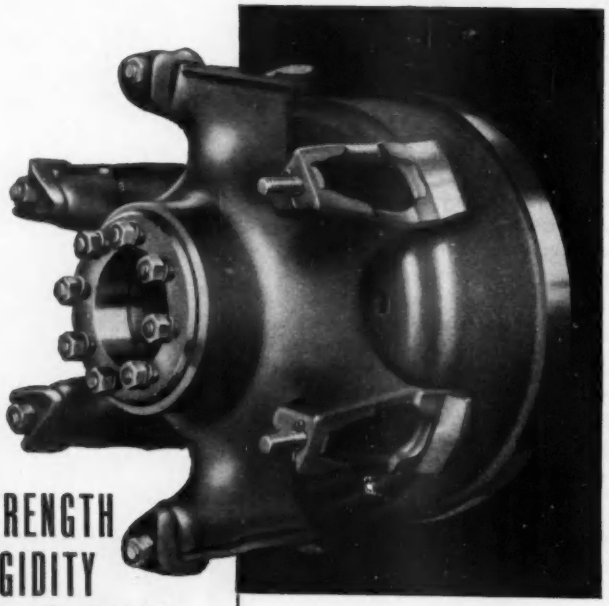
5. Nature and extent of contribution to the defense effort, including inventive and development contribution and cooperation with the Government and other contractors in supplying technical assistance.

6. Character of business, including source and nature of materials, complexity of manufacturing techniques, character and extent of subcontracting and rates of turn-over.

7. Such other factors as the consideration of the public interest and fair and equitable dealings may require, which factors shall be published in the regulations of the Board from time to time as adopted.

The final determination as to the

(*Turn to page 126, please*)



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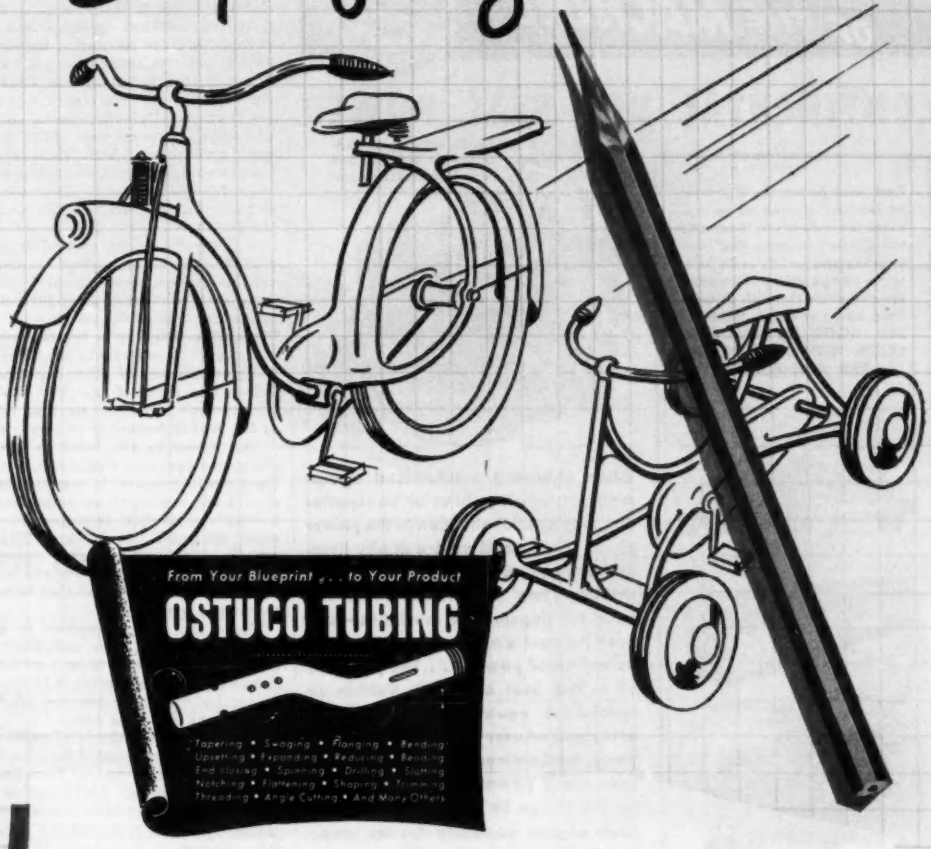
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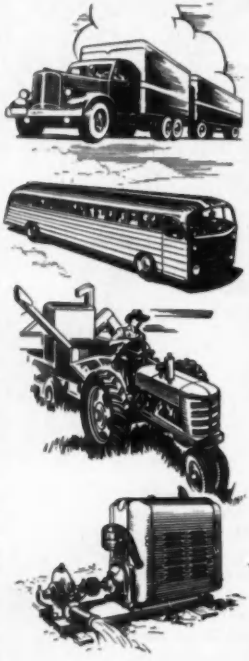
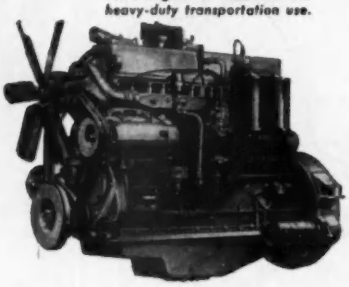


S-6749 — Six cylinder overhead-valve engine for industrial and heavy-duty transportation use.



When choosing mechanized equipment for industry, farm or transportation, pay special attention to the power plant. That's good advice at any time, and extra good today. The manpower shortage has hammered home the need for dependable machines—and even the best is only as dependable as its source of power . . . The presence of a Red Seal engine in vehicle or specialized equipment is an added assurance of user satisfaction over the years, for Continental Red Seal is truly specialized power. Continental's policy ever since 1902 has been to build each engine expressly for its work. Red Seal commercial models, ranging from ¾ to 270 horsepower, are built to more than 1,000 different specifications. And every model is engineered as an integral part of the equipment which it powers . . . You can place full confidence in the product of the manufacturer who has chosen Continental Red Seal as the heart of his machine.

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profit which the contractor is permitted to retain will be based upon the data submitted by him on the above factors.

Protective Renegotiation Measures

Now is the time for a contractor to consider the protective measures which he should take to insure a more intelligent determination by the Board. It is evident that the contractor through his own disclosures concerning his business places in the hands of the Board the tools which they can use in measuring his National Defense efforts. A busy executive, harassed with many production, procurement and financial problems, would not write the renegotiation brief for his company. He is too close to the work and won't do full justice to the report.

A company exists only if it makes profits. The life blood of a company can be drained away through lack of intelligent consideration or attention in preparing an adequate report. The profit of a company is not the work of one man. It represents the efforts of every employee of the organization. Never lose sight of the fact that the Government can eliminate that portion of the profits deemed to be excessive.

The renegotiation brief is perhaps the most important single report a contractor will prepare during the year. It should not represent an added duty to a busy comptroller, treasurer or some other executive. It is more than accounting "know-how" and should be prepared by someone with the ability to interpret those factors that best represent the company.

There are many measures to adopt and install within your company. Put them into operation now. After the close of your fiscal period it is too late. Protective measures recommended for adoption at this time are:

1. A thorough analysis of sales, with careful attention directed to the advantages which can be secured from the application of special provisions in the Act such as, mandatory exemptions, partial mandatory exemptions for durable productive equipment, inventory cost allowance and permissive exemptions.

2. Thorough analysis of all items of cost in order to justify them in renetiation proceedings. Maintain cost studies of National Defense work.

3. Preparation of adequate renegotiation files and the assembling of the data most beneficial to your company.

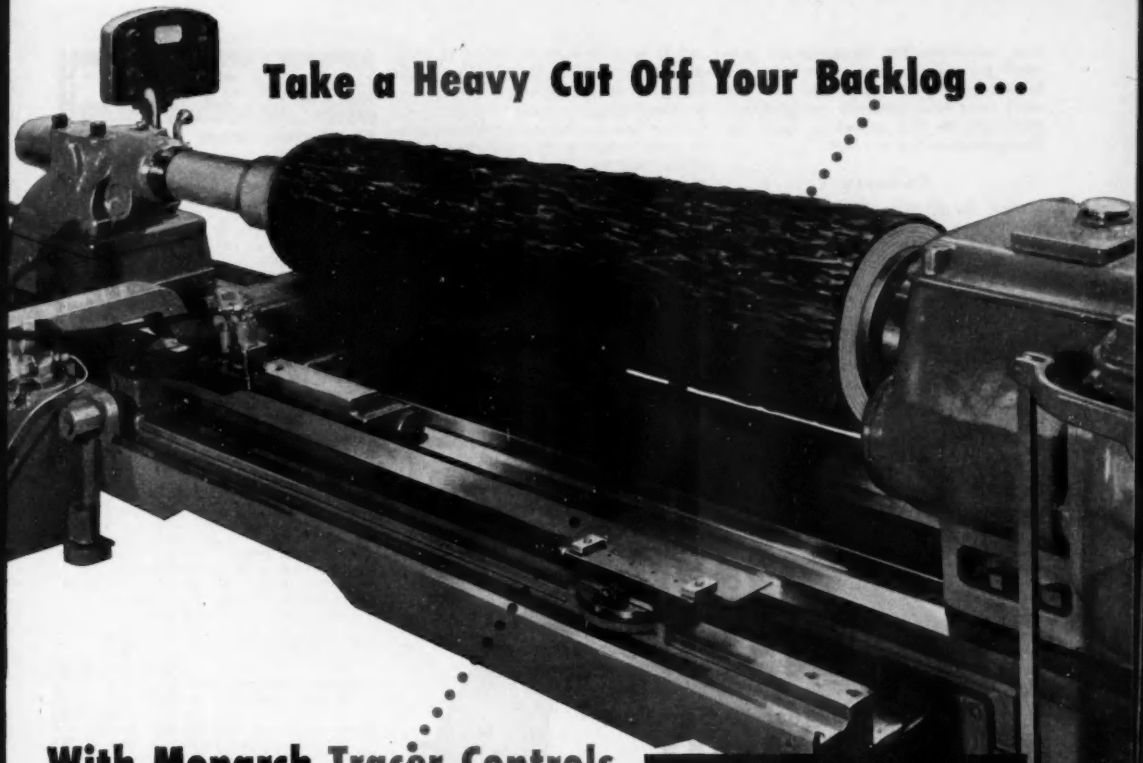
4. Formulation of a pricing policy for regular price reductions.

5. Analysis of the base period for cost trends as a guide for the current year. Presentation of facts on the position of your company within the industry.

Financial institutions before granting credit are now reviewing the contractors' statements in light of the effect renegotiation may have on profits before approving a loan. The informa-

(*Turn to page* 128, *please*)

Take a Heavy Cut Off Your Backlog...



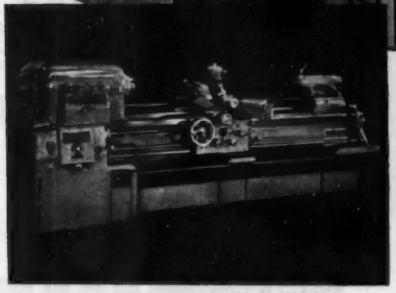
With Monarch Tracer Controls

Increased output within your present plant limitations is the quickest answer to today's demands—increased output as provided by Monarch tracer-controlled single point turning. Most new Monarch lathes can be equipped with one of the *three* types of Monarch tracer controls best suited to get this result.

Look at these actual job records! On a rotary grinder casing formerly turned on a turret lathe—*machining time cut* from over 22 minutes to 6. On a rear wheel spindle, formerly produced in over $2\frac{1}{2}$ minutes on 2 machines (one roughing and one finishing)—*machining time cut* to 24 seconds on a single Mona-Matic. On an aircraft engine mount, *machining time cut* from 47 minutes to 20 minutes, with 6 separate operations eliminated and accuracy and finish improved. On a 120" printing press roll, *turning time cut* from $7\frac{1}{2}$ hours to $1\frac{1}{2}$ hours.

You'll notice that we're talking increased output. Isn't the decreased cost obvious? And isn't this the equivalent of adding to your floor space? You can read all these into your production figures. Bear in mind that with the easily set up tracer controlled principle, you can realize all three advantages on short runs as well as long ones.

This is certainly the time to investigate production improvements like these. We'll gladly answer your inquiry with complete data, job facts, descriptions . . . *The Monarch Machine Tool Co., Sidney, Ohio.*



Monarch Series 60 Engine Lathe with Air-Gage Tracer Controls. For turning multiple diameter shafts and turning, boring or facing contours. Available with or without fully automatic cycle. Monarch has built fine lathes since 1909—3 types of tracer controls beginning in 1930.

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FOR A GOOD TURN FASTER . . . TURN TO MONARCH

tion assembled for renegotiation proceedings will answer many of your bankers pertinent questions. If you can't meet your banker's renegotiation test, how do you expect to meet the Renegotiation Board's test?

Summary

Once your sales have passed the $250,000 mark there is no way you can avoid renegotiation. It is the law of the land. It is the method adopted by our Government to correct errors in pricing, and to eliminate profits deemed to be excessive.

If your profits are worth defending and it is your earnest desire to cooperate fully with the Government on the subject of renegotiation you should prepare and submit a report which in your opinion best represents the efforts made by your company in the National Defense program. Make it one that you will be proud of and rest assured the Board will give you the consideration which your efforts entitle you to receive.

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Conventions and Meetings

SAE National West Coast Meeting, Seattle, Wash. .....Aug. 13-15
First European Machine Tool Exhibition, Paris .....Sept. 1-10
SAE Tractor and Production Forum, Milwaukee, Wis. .....Sept. 10-13
Sixth National Instrument Conference and Exhibit, Houston, Texas Sept. 10-14
Second Conference on Industrial Experimentation, Dept. of Industrial Engineering, Columbia University .....Sept. 17-21
American Society of Mechanical Engineers (fall meeting) Minneapolis, Minn. .....Sept. 25-28
Nat'l Metal Trades Assn., Chicago, Ill. .....Sept. 26-28
Sixth Annual Industrial Packaging and Materials Handling Exposition, Cleveland, Ohio .....Oct. 1-4
SAE National Aeronautic, Production Forum, and Display, Biltmore Hotel, Los Angeles, Calif.....Oct. 3-6
National Metal Congress and Exposition, Detroit, Mich.....Oct. 15-19
SAE National Diesel Engine Meeting, Drake Hotel, Chicago, Ill..Oct. 29-30
SAE National Transportation Meeting, Knickerbocker Hotel, Chicago, Ill. .....Oct. 29-31
SAE National Fuels and Lubricants Meeting, Drake Hotel, Chicago, Ill. .....Oct. 31-Nov. 1
American Petroleum Institute (31st Annual Meeting), Chicago, Ill. Nov. 5-8
American Society of Mechanical Engineers (annual meeting)..Nov. 25-30
Ninth Annual Pittsburgh Diffraction Conference .....Nov. 29-30
Motor and Equipment Wholesalers Ass'n. (Annual Convention) Chicago, Ill. .....Dec. 5, 6, 7

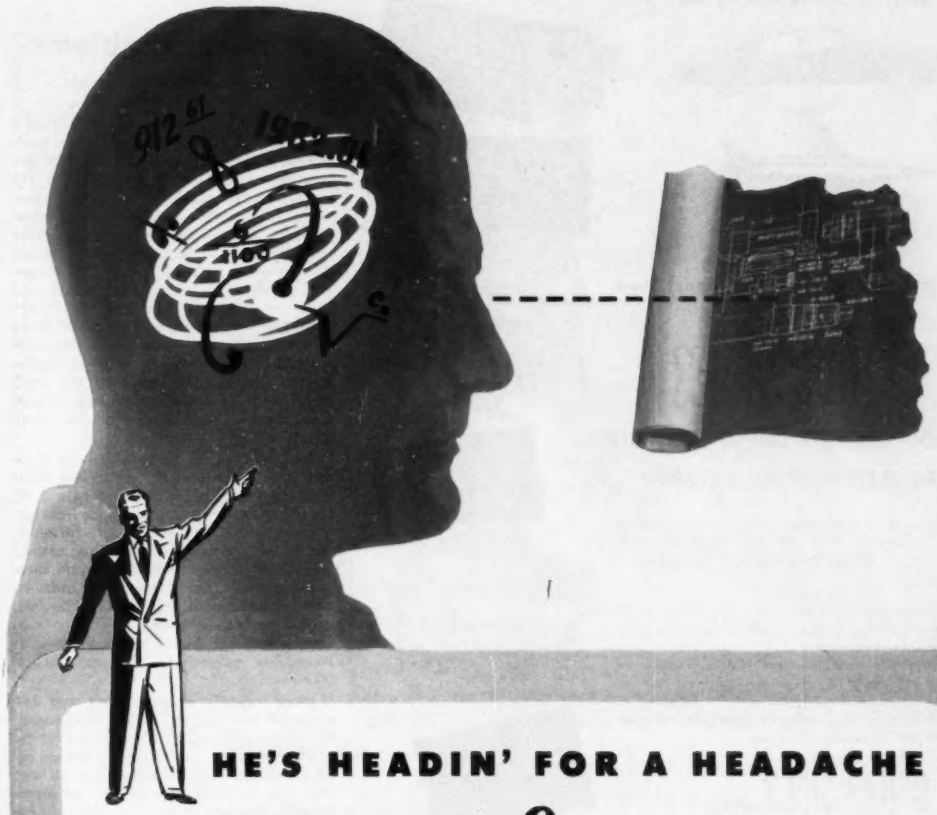
1952

SAE Annual Meeting, Detroit, Mich. .....Jan. 14-18
Society of Plastics Engineers, Inc. (eight annual technical conference), Chicago, Ill.....Jan. 16-18
Pacific Automotive Show, Los Angeles, Calif. .....Feb. 28-Mar. 2
American Society of Lubrication Engineers, Seventh Annual Meeting and Lubrication Show Cleveland, Ohio .....Apr. 7, 8, 9
American Society for Testing Materials (annual meeting) New York City .....June 23-27

BOOKS . . .

BOSCH AND THE DIESEL ENGINE, published by *Robert Bosch Co., Stuttgart, Germany.* It traces the development of injection equipment by Bosch under the following headings: The Successful Design, Tests on the Vehicle, Vehicle Engine and Stationary Engine, Additional Accessories for the Diesel Engine, The Bosch Pump as Standard, Bosch Gasoline-Injection Equipment, Peculiarities of Production and Materials, A Trip Through Our Shops, Customer Service, and Concluding Remarks. The book is written in German.

AUTOMATIC TRANSMISSIONS PRINCIPLES AND MAINTENANCE, by *Ray F. Kuns*, published by *The Bruce Publishing Co., Milwaukee, Wisc.* Price $4.00. This book gives an understanding of how the automatic transmission is designed as well as a complete guide to maintenance, service, test, and overhaul procedures. It covers only those transmissions which are currently available.



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.....*are you?*

Nearly every design engineer has had the same experience—developed a seemingly "perfect" new machine right up to the final blue print stage only to find hidden "bugs" that spell trouble ahead.

Often these "bugs" stem from bearings —their improper or inadequate application, *THAT IS!*

Most engineers, when confronted with anti-friction problems, turn to specialists —engineers who have accumulated years of experience and "know-how" in this one field. Such is the caliber of Aetna's engineering staff. Thanks to them, leading machinery manufacturers often save months of needless time, effort and expense in product development.

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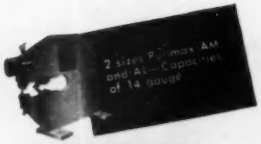
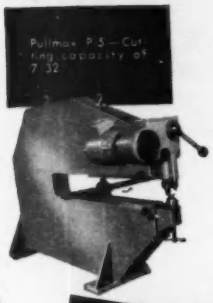
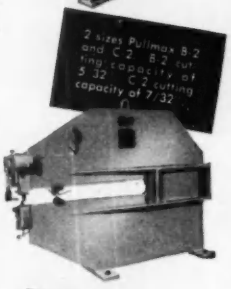
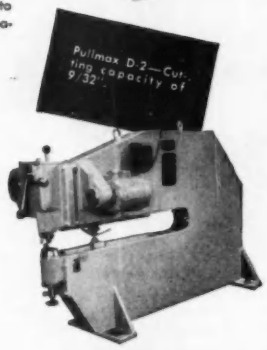
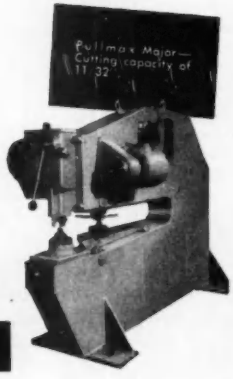
A reciprocating movable upper tool and stationary lower tool provides a smooth perpendicular cut that requires no further finishing. Upper tool can be raised to insert or remove work for cutting in center. Cutting capacities listed are for cutting mild steel.











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Forming Problems

(*Continued from page* 44)

mechanical properties and thickness tolerance; 110,000-130,000 psi yield strength (vs the ordinary 110,000 psi minimum) and ±.002 on thickness (vs "commercial" ±.004). In actual operation of the stretch machine the pressure to be applied is set at a value slightly greater than the yield strength of the piece to be formed. These special purchase requirements made it possible to eliminate some of the "feel" required by the operator since, if there were variations in yield strength among several pieces, one part would be slightly wrinkled at the inside of the bend (high yield) while another would elongate too far and fracture (low yield).

Secondly, brake-form tolerances cannot be expected to be much less than 1/32 in., and the width and height of this hat-section required much less tolerance than that for stretch forming. Since the operation of bending causes work hardening, it is necessary, on such critical parts, to have the bends in proper location to begin with. The fold operation was changed to Yoder-rolling. Thus, the bends made by rolling were less subject to shifting during stretching.

Very recently a hat section was designed to use Armco 17-7PH steel sheet. Although this material is reported to have elongation in the neighborhood of 30 to 40 per cent, it did not work out this way in forming and the one piece hat was redesigned into two flanges and a central channel to reduce the percentage of stretch. This is not to say that the elongation is not there, but being a relatively new material the methods of working with it have not been fully developed.

Joggling is, in many cases, considered to be a shrinking operation and in annealed aluminum alloys or steel can be successfully accomplished by compressing the metal. But half hard stainless steel sheet requires special consideration, such as joggling by displacement, by increase of bend radii, or by joggle reliefs.

In joggling preformed sheet metal sections, hats, zees, channels, etc., North American drafting procedures permit the manufacturing departments to joggle only one flange, or to displace the joggle through the entire section at their own discretion, unless otherwise specified by the drawing. In order to do the former, however, in half hard sheet, the bend radii must be adjusted so that the radius of the preformed section is equal to the nominal required plus the depth of joggle.

Joggles can be formed in the applicable gages through the use of proper flange reliefs or by fairing to large bend radii near the joggle.

Because of the non-uniform mechani-

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New Nash Rambler Adds Lasting Beauty... Greater Strength with Window Frames of Reynolds Aluminum

Next time you see one of the sleek, new Nash *Ramblers* with their unique styling . . . take a special look at the windows. The attractive rust-proof framing is a perfect example of how Reynolds Aluminum extrusions are used in modern design.

Nash designers and engineers used extruded aluminum frames because: (1) they offer tremendous savings in material and labor through the use of smaller blanks for door-panels (2) aluminum extrusions are easily installed (3) channel inserts and special trim are eliminated (4) aluminum stays bright and attractive.

Profit from the future-thinking of Nash engineers . . . put aluminum on *your* drawing boards for *tomorrow's* designs. Inexhaustible supplies of bauxite ore and expanding aluminum production facilities assure a steadily mounting supply of *tomorrow's main metal.*

Reynolds Aluminum Specialists are now working with many companies on their future designs. They will be glad to work with your designers to assure you of the maximum benefits of aluminum—low cost, light weight with strength, natural attractiveness, wide range of finishes, freedom from destructive rust, ease of fabrication.

Today, call the Reynolds office listed under "Aluminum" in your classified telephone directory. Or, write Reynolds Metals Company, 2587 South Third Street, Louisville 1, Ky.

***and* TO THE MAN IN CHARGE OF TODAY'S PRODUCTION**

Do you have a defense contract that specifies aluminum? To eliminate production problems, acquaint yourself with the accepted production techniques for fabricating aluminum. Write for complete list of Reynolds technical books covering every phase of fabrication. And for *special* problems, take advantage of Reynolds trained staff of aluminum specialists.

REYNOLDS METALS

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

cal properties of half hard stainless, canopy tracks of C-section type have remained among the most difficult of all parts to fabricate. Yoder-rolling has been the most successful method but requires large quantities for economical production because of tooling costs. Punch press form dies cannot consistently form these parts with accuracy. Close mating of half hard C-sections should not be attempted.

It is desired to point out that the foregoing descriptions of various approaches to problems in forming half hard stainless steel sheet have not been directly compared to the forming of other alloys. Half hard can be formed by bending in straight lines or by stretching or elongating flanges but cannot be compressed as in "shrink" flanges. This restriction, plus the variations in mechanical properties, set it apart from all other currently used aircraft materials. Allowable elongation of half hard ranges up to 18 per cent but it is unwise to attempt to take advantage of the full amount since rejection rates will be increased. To specify the purchase of other than standard sheets, such as special tolerances on thickness or mechanical properties, results in mill cost extras, delayed procurement, extra care in handling through receiving, inspection, warehousing, planning and material preparation. The use of heat treatable stainless is only a partial answer as our most recent experience indicates—the hat section designed for the use of Armco 17-7PH. If the cost of production (including high cost tooling, know-how and special care) is to be considered, annealed stainless of the type 302 and 347 should be considered for those difficult parts cited here, even though this means an increase in thickness and weight.

Where half hard stainless sheet must be used: (1) Specify larger bend radii in joggled sections; (2) provide flange reliefs adjacent to joggles in hydropress or punch press parts for possible use by the manufacturing departments; (3) design for the optional method of joggling preformed sections, by displacement or by reforming bend radii; (4) do not use half hard for compound curves, such as skins.

Band Tool Slotting

(*Continued from page 60*)

dimension of the teeth. If the set dimension is 0.042 in., that particular band will cut a kerf or slot of approximately 0.039 in. The slot created will always be 0.002 in. to 0.005 in. less than the actual set dimension. The latter will vary slightly depending on band velocity, work thickness, and cutting rate. Once the exact set dimension, side clearance and side clearance angles are established, the band tool will operate until the cutting edge life has been reached without losing excessive slot size. Cutting rates range from 0.125 to 1.50 sq in./min depending on the type of ferrous metal, thickness, and surface finish requirements. Cutting rates on non-ferrous metals are considerably faster.

"Line Grinding" band tools may be employed for slotting hardened metals and alloys without heat distortion or penetration. In addition they may be used for slotting products such as glass, porcelain, granite, etc. In this instance the cubical shape abrasive cutting edge will create a slot of approximately 0.080 in. to 0.125 in. depending on the amount dressed and wear-back.

Western Gear to Build New California Plant

Western Gear Works will build a new $2 million gear manufacturing plant at Belmont, Calif., which is expected to be in operation by late summer of this year, according to Thomas J. Bannan, president of the company. The plant, on a 13-acre site, will employ over 300 persons in the manufacture of special gear drives for an Army personnel carrier-type vehicle.

AFTER exhaustive and revealing tests have demonstrated the superiority of VULCAN special-purpose diaphragm materials, many of the leading automotive part manufacturers are now switching to VULCAN diaphragms. Wherever diaphragms are used—as in fuel pumps, vacuum booster pumps, dashpot mechanisms and others, these materials excel in performance. They are highly resistant to gasoline, aromatics, oils, alcohols, butane, propane and solvents. They also provide high tensile and burst strength. They insure long life in continuous service. Investigate these new, improved diaphragms. It will pay!

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The response of N-A-X HIGH-TENSILE steel to severe cold-forming operations and its excellent weldability by electric arc or resistance, atomic hydrogen or heliarc, and all other processes, are added important characteristics of N-A-X HIGH-TENSILE steel.

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The use of low-alloy, high-strength steels in military equipment assures longer life with less deadweight.

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N-A-X Alloy Division • Ecorse, Detroit 29, Michigan

NATIONAL STEEL CORPORATION

BUSINESS PULSE

(*Continued from page 52*)

lawed; curbs on consumer credit will be loosened; and the new act as a whole will narrow the regulatory authority of the Government instead of following the Administration's proposals to broaden it. There were indications toward the end of June that the Administration would accept an extension of the existing law without revision. Stabilization officials, however, protested especially against the proposed ban on all price rollbacks, pointing out that such action would prevent a lowering of ceilings on processed goods even in cases where prices of raw materials or other costs had declined.

Investigation of WSB Policies

The always-controversial matter of jurisdiction continues to harass the section of the stabilization program dealing with wage control. The operative area of authority of the Wage Stabilization Board has been under investigation by four Congressional committees. Critics of the present board's policy have struck particularly at the board's power to rule on labor disputes in general. They maintain that such action goes beyond the field of wage stabilization and tends to substitute governmental authority for the collective bargaining process as a whole. They fear that the board will be used as a means of evading the procedures prescribed by the Taft-Hartley law.

Two of the committees recently issued somewhat conflicting reports. A House Labor subcommittee has recommended that the board be abolished and replaced by a body limited to making and interpreting general policy and having no authority in cases involving disputes, except where an interpretation of policy is involved. A report issued at the same time by a Senate Labor subcommittee takes quite a different position, holding that the board's power to deal with disputes "neither adds nor detracts from the rights of labor and management in collective bargaining; nor does it contravene any law."

Administration officials have held that the power is not intended to "short-circuit" collective bargaining but is being held in reserve for use where necessary to settle disputes which might threaten defense production. At the moment the matter seems to be rather academic, since no cases involving disputes are reported to be before the board. Applications for wage increases, however, have been so numerous that the board has been unable to process them. A backlog of 3500 pending cases was recently reported as awaiting decisions. Besides dealing with this flood of applications, the board has been trying to formulate a general policy to replace the case-by-case method used so far.

Materials Situation Under Fire

Governmental controls are under attack in still another area. Many observers seem to feel that the extent and timing of restrictions on the use of strategic materials have been inexpertly managed, particularly where some companies are receiving more materials than can be used, while companies producing consumer goods are needlessly deprived of such materials. It has been pointed out that such firms suffer financial losses, workers are laid off, consumer supplies are unnecessarily reduced, and inflationary tendencies are strengthened. So some extent mobilization planners are admittedly aware of the danger, recognizing the possibility of unexpectedly large supplies of materials and inventories, and unexpectedly small military demands.

Rising Costs

There is a direct relation between material allocations and price stabiliza-

(*Turn to page 136, please*)

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During normal times and emergency times — for the past 36 years — Lamb Electric Motors have had an outstanding performance record in many motor-driven products.

Behind this good performance is the fact that Lamb Electric Motors are *specially engineered* to provide the exact mechanical and electrical requirements for each product they drive.

Other advantages often obtained are reduced product weight, compactness, and lower cost.

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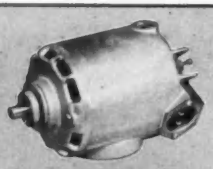
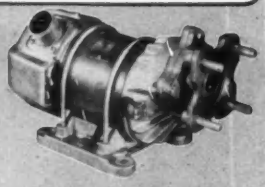


Having inbuilt control switch and receptacle, this motor is readily adaptable to portable tools and equipment.



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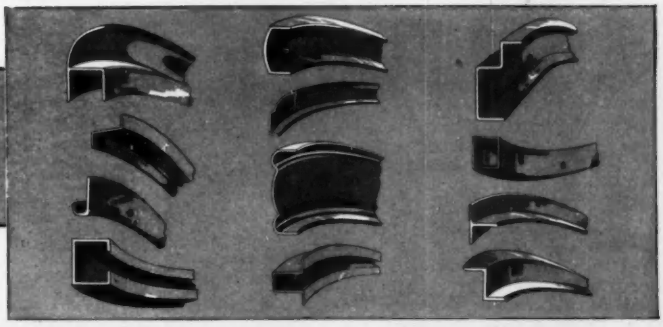
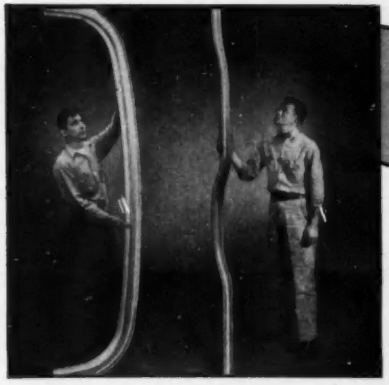
A few of the cross sections curved and bent by BATH Metal Form Division.





Trailer roof cap (left), formerly an assembled section, is formed in one piece by BATH. Coach frame (right), includes reverse bends.

Curves not normally formable, or too costly to form on conventional equipment, are no problem for the BATH method.

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tion, because forced reduction of output raises unit costs and exerts upward pressure on prices. Companies whose costs rise sufficiently to reduce profits below a specified level are, under present policy, entitled to price relief. Some observers hold that such increases in costs contain the greatest potential threat that the stabilization program will have to face. The program will be especially vulnerable, it is thought, during the third quarter of this year, when leading divisions of the consumer durable goods industries find their supplies of materials from 30 to 40 per cent lower than a year ago, and will be even more serious under the closer restrictions planned for the fourth quarter and those anticipated in 1952.

Home Building

The government plans to continue through 1952 its present policy of permitting the erection of 850,000 new homes annually and to allow total construction, including industrial and residential building, at 80 per cent of the 1950 level. In May a contraseasonal decline in home building and a less than seasonal increase in total construction are reported. Because of sharp increases in earlier months, the total value of new construction put in place during the first five months of the year was 19 per cent above the corresponding 1950 figure.

Plant Expenditures Higher

Despite uncertainties of supply in both the manpower and materials markets, business expenditures for plant and equipment are now estimated at even higher totals than were forecast earlier in the year. Such outlays in the second quarter of the year are now placed at the record figure of $6.4 billion, and this rate is likely to be maintained in the third quarter, according to official sources. Total outlays in the first nine months of the year are expected to reach $18 billion, or 41 per cent more than in the corresponding period of 1950.

Shown above is one of a battery of REEVELEC 5KW Heaters Used By American Phenolic Corporation of Chicago for precision high production silver brazing of RF Cable Fittings.

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BOOKS . . . .

AMERICAN STANDARD ON TOLERANCES FOR BALL AND ROLLER BEARINGS published by the *American Standards Association, 70 East 45 Street, New York* 17. Price $0.75. It is the second of a series of antifriction bearing standards under development by a committee representing 14 trade associations, technical societies, and the U. S. Army and Navy. The standard contains 15 tables specifying tolerances on the bore, outside, diameter, width, and other characteristics of a bearing in different grades of accuracy required for various bearing applications. Types of bearings covered are: annular ball; cylindrical roller (including journal); magneto; airframe; thrust ball; industrial and airframe needle; and tapered roller bearings.

DER LADUNGSWECHSEL DER VERBRENNUNGSKRAFTMASCHINE, ZWEITER TEIL. DER ZWEITAKT (Change of Charge in the Combustion Engine. Part II, The Two Stroke Cycle), by *Prof. Dr. Hans List*, published by *Springer Verlag, Vienna, Austria*. Price, $16.50. This is the second part of Vol. IV of Prof. List's monumental 16-volume work on the combustion engine and deals with intake and exhaust phenomena in two-stroke engines. Part I of the same volume deals with the same phenomena in four-stroke engines. In the part under review methods are developed for calculating the required port dimensions for two-stroke engines of different types.

SERVOMECHANISMS AND REGULATING SYSTEM DESIGN by *Harold Chestnut* and *Robert W. Mayer*, published by John Wiley & Sons. Of timely importance because of the rapidly accelerating military program, this book is based upon the experience of General Electric engineers in designing control systems and regulators. Considerable space is devoted to the solution of complex mathematical problems and concepts—complex numbers, Laplace transforms, differential equations, etc. It emphasizes feedback control concept and develops methods for mechanical, hydraulic, and steering system transfer functions. It stresses the practical approach to system synthesis, touching on dynamic as well as static error coefficients. Charts indicating the nature of design characteristics and the solution of specific problems go far to round out the presentation of this developing art.

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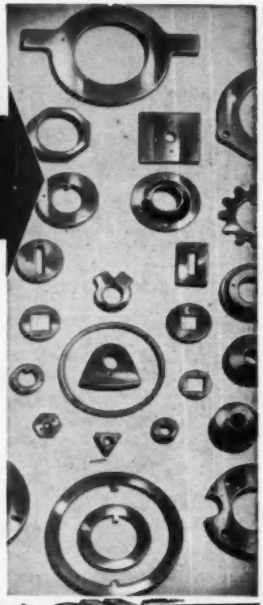

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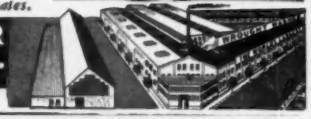

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NEW PRODUCTS

For additional information please use coupon on page 56

(*Continued from page* 92)

Uses include unit heaters, boilers, wall furnaces, water heaters, circulating heaters, gas floor furnaces and forced air "blowers." In each of these installations, the MR-5 valve serves as the manual shut-off valve, as well as the safety shut-off in event of pilot failure.

F-22—Rust Proofing Phosphate Coating

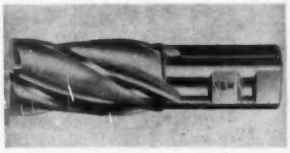
For superior corrosion resistance, a new rust proofing process, Perm-Cote —a phosphate coating material developed by Detrex Corp., Detroit, Mich. —is recommended as a replacement for cadmium or zinc in many rust-proofiing applications.

When immersed in a solution of the material, iron and steel surfaces are chemically converted into a dark gray, uniform, dense, non-metallic phosphate coating. After rinsing, the highly absorbent coating is impregnated with a rust-proofing oil known as Perm-Oil, giving the products a permanent corrosion-proof layer that is dry to the touch.

Standard salt spray tests are said to indicate a resistance well in excess of the 36 hrs required in US Army Specification 57-0-2c, Type II, Class B.

Typical applications for Perm-Cote are in the treating of metal fasteners, springs, hardware and hand tools, appliances, sheet metal parts, rockets, clips and links, mortar shells, etc.

F-23—Heavy-Duty End Mills



Latest addition to the line of "Hi-Helix" end mills manufactured by Pratt & Whitney, Div. Niles-Bement-Pond Co, West Hartford, Conn., are these heavy-duty end mills with 2-in. diam shanks and fast-cutting helix. Having ample chip clearance for taking heavy end milling cuts, they are suited also for Kellering, die sinking and similar work. Shanks are of the Weldon type and have two set screw flats for positive drive. Made of high speed steel with right hand cut and right hand spiral flutes, the cutters range in diam from 2 to ½ in., and in length of cut from 4 to 6 in.

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*Engine Cleanliness!
*Long Engine Life!

ROAD TESTED from Quebec to Key West and back ... under the exacting supervision of the famous American Automobile Association ... standard popular-make cars were not babied, not pampered. They were driven as you would drive your own car. Cars using NEW Sunoco Dynalube were driven over 2,000 miles, on the average, before a drop of oil had to be added.

NEW Premium Heavy-Duty Sunoco Dynalube is one of the very few motor oils that meets or exceeds manufacturers' recommendations for all 1951 passenger cars

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1. Tough **Heat-Resistant Body** assures long motor oil mileage.

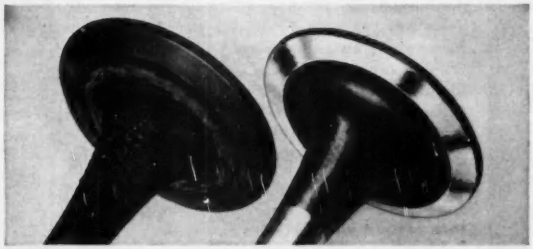
2. Fully **Detergent-Dispersant** — NEW Sunoco Dynalube cleans engines and keeps them clean. Road dust and contamination from normal combustion are held in harmless suspension until oil is drained at the regular interval.

3. Free-Flowing and **Metal-Clinging** qualities of NEW Sunoco Dynalube prolong engine life.

4. Anti-Rust and **Anti-Acid** — NEW Sunoco Dynalube counteracts two of the greatest causes of wear in the vital combustion chamber areas of any engine.

5. High **Film Strength** and **Ring-Sealing Action**— insure longer-lasting engine efficiency.

NEW Premium Heavy-Duty Motor Oil Combines in a Single Oil *All* the Finest Features of America's Premium Motor Oils . . . Actually *Improves* the Condition of Most Engines.



LAB FINDINGS. Valve on left shows heavy deposits resulting from use of inferior oils—a common cause of sluggish action and poor valve seating. Clean valve on right shows how NEW Sunoco Dynalube helps engines stay remarkably clean ... keeps valves free-acting ... maintains full engine power. **HYDRAULIC VALVE LIFTERS, in particular, need the *extra* detergent-cleansing protection of this new heavy-duty premium motor oil ... another important reason why motorists owning cars equipped with hydraulic valve lifters should change to NEW Dynalube.**

Memo to AUTO ENGINEERS: *After* road-testing New Dynalube and stripping down engines, the AAA certified these lab findings: "complete absence of injurious varnish or sludge" ... "all piston rings were free and clean" ... "no carbon built up on underside of valves" ... "complete absence of rust on cylinder bores and other moving parts."

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S-4—Extreme-Pressure Temperature Grease

For the lubrication of aircraft gears and actuators at temperatures ranging from 65 below zero to 250 above, a new extreme-pressure grease has been developed by Shell Oil Co. of New York, N. Y. Called Aeroshell Grease 7, it is designed to ensure fast, smooth action of gears, actuator screws and other parts of these units where design requires the use of a single grease. Until now, it is pointed out, several special lubricants have been needed to ensure good performance under the whole range of temperature and pressure conditions found in high altitude and high speed flying. The new grease contains synthetic oils and fortifying agents.

S-5—Strain Analyzer To 50,000 Cycles

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Known as the H-42A Strainalyzer, it provides simultaneous observation

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and recording of four separate traces on a single 5-in. oscilloscope tube, each appearing in correct time relationship without necessity of optical alignment.

As a typical application, the Strainalyzer can be used to check relative pressures at four different points of a gun barrel. In rocket and jet engine testing or research, firing cycle, the

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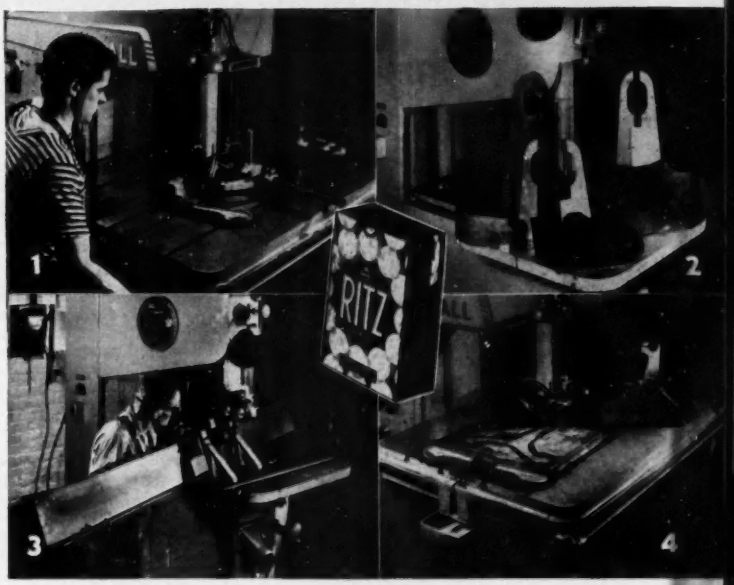

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AT National Biscuit Company's machine shop in Evanston, Illinois, DoALL Band Machines really earn their keep. They work all the time on all kinds of jobs. They cut any material—even the hardest steel. One job originally calculated to take a week's time was done in three days on the DoALL MP-20. Other work formerly done on milling machines is now done much faster at less cost on DoALL's.

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Learn about jobs that DoALL Band Machining can do for you. Find out about blades for cutting every material; how you can saw, grind, hone, polish, friction saw—cut any shape. Write today.

B-2

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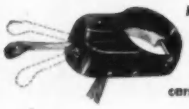
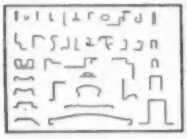
TURN SIGNAL SWITCHES

Semi- automatic, self-cancelling. Afford drivers easy, positive way to indicate turns to approaching and following traffic as well as to pedestrians.



Mitchell clamp-on and screw-type semi-automatic turn signal switch for trucks, cars, buses, tractors.

Mitchell 6-wire concentric-type semi-automatic turn signal switch used in passenger cars.



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Complete range of metals, designs and gauges in stainless steel, aluminum, brass, bronze, copper—cold rolled, drawn and pressed—for automobiles, airplanes, railroad cars, architectural requirements, radios, television receivers, all industrial uses.

Our sales engineers work with you in the application of Mitchell products to your specific designs. Call on us at any time.

UNITED SPECIALTIES COMPANY
Mitchell Division, Philadelphia 36
Ignition and Turn Signal Switches • Rolled Shapes • Dovetails
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CHICAGO 28
Air Cleaners • Metal Stampings

New AIRCRAFT PRODUCTS

For additional information please use coupon on page 56

chamber pressure, thrust, and temperature may all be recorded simultaneously. All four traces appear simultaneously on a 5-in. screen for absolutely correct time and phase relationship. Recording in the Strainalyzer is accomplished with a Fairchild Oscillo-Record camera.

Other uses for the instrument range from strain, stress and vibration studies in such equipment as aircraft and automotive units to presses, internal combustion engines, all rotating and reciprocating mechanisms and many others. Highly compact, the Strainalyzer provides all controls accessible on a single panel.

Model H-42A is designed for dc bridge excitation from self-contained batteries and has the necessary high-gain dc amplifiers, balance controls, and voltage and calibration controls for each strain gage bridge channel. It is used in conjunction with standard strain gages.

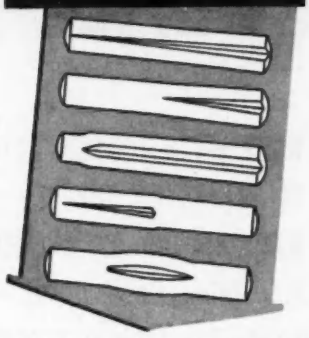
Sweep durations of the linear sweep generator have been extended to 10 seconds for accurate study of extremely low-frequency phenomena. A double-ended input gives flexibility, and improved attenuators allow the amplifiers to handle larger signals. Drift of the dc amplifiers is stated to be practically negligible. The instrument is not acoustically sensitive. When operated within 15 ft of the firing of a 400 lb rocket with only a blast wall between, no microphonics are detectable. The cathode ray tube is a four-gun type designed especially for the Strainalyzer. The entire unit is housed in a steel console and mounted on castors, for easy mobility.

S-6—Range and Broadcast Receiver

A low-frequency range and broadcast receiver for aircraft is a product of the National Aeronautical Corp., Wings Field, Ambler, Pa. Designated LFR-1, it weighs 35 oz and plugs into any standard NARCO power modulator unit used with the NARCO omni of VHF communication installation. Separate power supply will be available.

The new radio features a new "pancake" design 2¼ in. high; 6⅛ in. wide; and 6⅝ in. deep, permitting installation in a small space in or below any instrument panel. The electronic circuit of the receiver has seven tubes, including those used in the power modulator unit, and provides a germanium crystal diode detector. The new NARCO receiver gives extreme selectivity for separating stations. Dial

Is there a spot in your specs for Groov-Pins?



STUDY the specifications for your product more closely. Are there places where Groov-Pins could reduce assembly time—improve compactness, strength, durability?

The manufacture of superior quality grooved press fit fasteners is an old story to us. We have been doing it for twenty-five years and have solved the pin fastening problems of many prominent manufacturers. We believe we can help you, too.

We are confident that today, as always, Groov-Pins are the best pin fasteners you can use because:

(1) They reduce assembly time and costs. Installation requires only straight drilled holes — no tapping, reaming, milling, peening.
(2) They are amazingly resistant to vibration and shock—make neat, rigid, strong assemblies.
(3) They are available in seven different standard types and in special designs to suit requirements.
(4) They are equal or superior in shear strength to any similar fastener of the same diameter and material.
(5) They can be driven by hand, air cylinder or hydraulic press.
(6) They can be removed and used repeatedly.
(7) Thousands of applications have demonstrated their advantages for many years.

Send for samples and literature and see for yourself.

•

Also manufacturers of Top-Lok Inserts.

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GROOV-PIN CORPORATION

2010 Kerrigan Avenue
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Mallory Engineering Experience

Solves Power Supply Problem With Unique Vibrator Application

MALLORY VIBRATORS

Mallory Vibrators are based on exclusive design and manufacturing methods that assure long, trouble-free service. Send the details of your application. Get Mallory's recommendation on the Vibrator or Vibrapack* power supply best suited to your needs.

*Reg. U.S. Pat. Off.

The versatility of the Mallory Vibrator and the practicality of Mallory engineering have been demonstrated in a growing variety of power supply applications.

One customer had been experimenting with germicidal lamps in produce trucks to retard bacterial action... but was stumped by the need for an efficient power supply. Mallory tackled the problem and came up with an ingenious application of the Mallory Vibrator . . . plus complete technical data for producing the complete power unit assembly.

That's service beyond the sale!

Mallory electronic know-how is at your disposal. What Mallory has done for others can be done for you!

Vibrators and Vibrapack* Power Supplies

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MALLORY

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START with **PERMA** Seats and Cushions

. . . specially designed or standard—you'll start *right* with a quality-built seat from Perma Products. You'll reduce driver fatigue, too, because Perma seats are *engineered,* cost less per year of service*—and the cost is right, too. On *your* next seating job, why not consult Perma Products—as leading manufacturers do. Send us your prints for prompt service and estimate.

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*Commercial Car Journal says average seat cushion life is 45,931 miles.

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ACE PRECISION NYLON BALLS
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G. A. Norgren Co., Denver, Colorado, uses Ace Nylon Balls as feed tube checks in Micro-Fog Lubricators to provide instant oil flow.

Ace Nylon Balls of DuPont Nylon FM #10001 are mass produced to close tolerances giving you the advantages of toughness at low temperatures, form stability at high temperatures, light weight, chemical and abrasion resistance.

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Precision Plastic Fabricators
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New AIRCRAFT PRODUCTS

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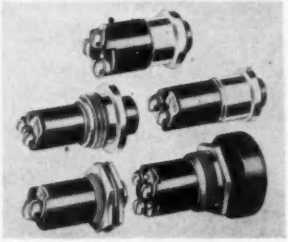
is edge-lighted with a special "Army red" light for minimum fatigue during night operation.

S-7—Aircraft Pushbuttons

Reinstatement of aircraft pushbuttons to supplement the existing line of aircraft circuit breakers is announced by Square D Co., Detroit, Mich. These pushbuttons are specifically designed for aircraft service in such functions as fire control, turret control, communication circuits, signal systems, and remote control of relays, solenoids and motors.

Performance data describes vibration resistance at frequencies up to 55 cycles per second, with a total extrusion of 1/16 in. without contact arcing. Acceleration up to 10 G's will not cause malfunctioning in any position. Full rating of 15 amp inductive load at 30 volts D.C. is possible at 40,000 ft above sea level. Temperature range from −650 F to +160 F will not interfere with proper operation of the button.



Square D aircraft pushbuttons.

Two basic types are now in production. The two point, two terminal type is available with either normally open or normally closed contacts, in a variety of flange and mounting arrangements. The three point, three terminal type is furnished with normally open contacts, with various mounting arrangements, and identification disks under the Lucite cap.

S-8—Plastic Aircraft Protective Coating

A new plastic aircraft protective coating, Syn-Cote, is now available from Roscoe Turner Aeronautical Corp., Indianapolis, Ind., for use on all types of aircraft surfaces, metal, wood or fabric. Available in transparent form, or in six brilliant stock colors, this non-

(*Turn to page* 146, *please*)

This library of the latest Gaging Information from Accuracy Headquarters will help you maintain better

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Help Lower Unit Production Cost to Meet Competition *Profitably . . .*

Simplified screw driving, bolt setting and nut running mean lower unit cost. This is possible with Pheoll products because they are inspected through all manufacturing steps from coil wire or bar stock to the finished product.

All threads, whether rolled or cut, are carefully gauged to American Standards. Screw and bolt heads are formed, slotted or recessed to meet rigid engineering requirements. Overall quality of the finished product is uniformly high. Precision head formation on all bolts as well as engineered slots and recesses in all screws means less wrench and driver slippage.

Pheoll engineers will recommend the correct type, size and finish of standard or special screws, bolts and nuts for your needs.

WHAT PHEOLL INDUSTRIAL FASTENERS MEAN TO YOU	CHECK THESE PHEOLL PRODUCTS FOR YOUR NEEDS
● Simpler and speedier assemblies.	☐ Machine Screws
● Less worker fatigue — more units.	☐ Sems
● Improved product appearance.	☐ Tapping Screws
● Added latitude in product design.	☐ Square Head Set Screws
● Immediate and dependable source for standardized, interchangeable screws, bolts and nuts especially suited to mass production.	☐ Threaded Cutting Screws
	☐ Cap Screws
	☐ Phillips Recessed Head Screws
	☐ Machine Bolts
	☐ Wing Nuts
	☐ Knurled Nuts

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SCREWS • BOLTS • NUTS
Industrial Fasteners and Holding Devices

Misch Metal Promotes Hot Workable Alloys Output

A discovery of importance to the defense effort because it promises a greater supply of strategic metals, has recently been announced by Carpenter Steel Co. of Reading, Pa. Originating in Carpenter laboratories, the discovery is being made available to all steel producers through licensing agreements.

The discovery transforms certain "non-workable" high alloy, corrosion resistant and heat resistant steels into products that can be readily hot worked. These steels can now be produced in bar, rod, sheet and tube forms. The discovery finds timely use in such applications as parts for jet and turbojet aircraft, and for heat and corrosion resistant valves in internal combustion engines.

The two pancakes shown are of the exact same analysis—except that the one on the left, relatively free of cracks and tears, contains cerium. Picture shows results of cone test for hot forgeability of Carpenter 21-12N valve steel. Test consists of casting a cone of metal, heating to selected forging temperature, and upsetting or hammering it into the flat "pancake" illustrated. Test can be used to determine the optimum amount of cerium to be used in a particular grade of steel, and also to determine the best range of forging temperatures.

Solving a hot working problem which has plagued the steel industry for years, it consists of the proper application of a rare-earth element called cerium, to the alloys in question. Cerium by itself or in combination with its sister element, lanthanum, are both found in misch metal. Although pure cerium or pure lanthanum may be used separately, Carpenter discovered that combinations of the two metals within certain minimum and maximum proportions are effective.

The discovery applies to ferrous alloys containing nickel and one or more of the elements chromium, molybdenum, cobalt, copper, tungsten, silicon, manganese, columbium and vanadium. A principal obstacle to the full utilization of the advantages offered by these alloys has heretofore been the difficulty or practical impossibility of forging and rolling them into shapes like sheets, rods and tubes. This obstacle thus restricted the alloys in certain applications involving high temperatures, stresses and pressures.

For example, certain alloys containing nickel, chromium, molybdenum and copper — which provided satisfactory corrosion resistance and castability— became so badly torn or cracked in bar form when hot working was attempted, as to be unuseable. Thus these alloys had been limited to those fields in which castings could be used.

The discovery points to the fact that the nickel content of any of the alloys determines the minimum and maximum allowable ranges of cerium and lanthanum which will produce hot workability. It is further discovered that as the nickel content increases in any of the alloys, the allowable range of cerium and lanthanum which can be used to promote workability, is narrowed.

The Carpenter patented corrosion and heat resistant grades in the new cerium-bearing alloy range include Stainless AISI Types 309, 310, 316, 317, 330, as well as Carpenter Stainless 20, and Carpenter austenitic valve steels. The discovery applies not only to ferrous alloys containing more than 50 per cent iron, but also to non-ferrous alloys containing little or no iron.

Principal source of cerium and lanthanum is monazite sand. The supply of cerium and lanthanum recently has received a boost because of the intense interest in certain heavy elements so vital to the production of atomic energy.

New *AIRCRAFT* PRODUCTS

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(*Continued from page* 144)

inflammable material covers the surface with a pliable adhesive sheet of plastic that forms a non-porous protective seal against oxidizing and the corrosive effects of weather. It is said not to check, crack, or peel in extreme heat or cold.

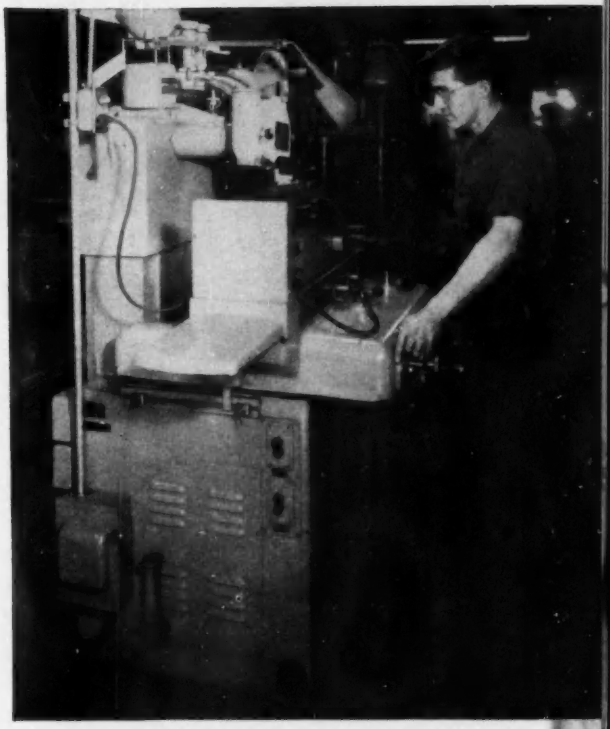
The transparent plastic keeps painted surfaces from fading, and can be easily removed when damaged surfaces are in need of repair. Syn-Cote can then be reapplied to the repaired surface allowing new and old painted surfaces to match.

Syn-Cote does not soften in oil and resists gasoline, acids, salt water and alkalies, as well as abrasion by sand and dust, the company reports. One-half gallon covers the average light plane, and dries quickly to less than two lbs added weight.

SAVES 5½ HOURS GRINDING FORM TOOL

DoALL "COOL-GRINDING"
(U.S. PATENT NO. 2470350)

PRINCIPLE MAKES POSSIBLE FASTER WORK, GIVES STRAIGHTER CUT, PREVENTS WARPING



TAKE a tip from Biddle Screw Products, Sheridan, Indiana. The carbide bar in one of their large screw machines would warp under normal cutting conditions. The cut was taking ¾ of a day and the piece wasn't always satisfactory.

Then they turned to DoALL "Cool-Grinding" of the carbide bar. The coolant *flows through* the wheel and atomizes at the point of work. *Standard wheels are used.*

RESULTS? No warping, a straight cut, perfect pieces — *and only 30 minutes to do the job!*

You wouldn't believe tool grinding could be that important, but DoALL "Cool-Grinding" *does* produce *amazing* results everywhere it is used.

SEE FOR YOURSELF. Ask to have a Free DEMONSTRATION right in your own plant. Call your local DoALL Sales-Service Store or write:

THE DoALL COMPANY • 254 N. Laurel Ave., Des Plaines, Ill.

"COOL-GRINDING" COOLS AT THE POINT OF CONTACT . . .

Coolant is metered into the hub of the wheel, forced centrifugally through the pores and out in a fine mist *at the point of contact of wheel and work.* No other system can do this. No other system gives such fast, smooth, accurate results with no burning or checking.

SEND FOR CATALOG TODAY

— find out how "Cool-Grinding" works, learn all of its time, labor and money-saving benefits. Lists all models of DoALL Precision Grinders for toolroom and production work.

INDUSTRY'S NEW TOOLS

DoALL

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GR-1

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Carbon, Alloy and Stainless steel tubes are defined under CMP regulations as "controlled materials". As such, they are critical materials. Not being a mind reader, "Mr. Tubes"—your B&W Tube Company representative—needs a *close* look at the following facts in order to supply the available tubing most economically suited to your requirements.

1 All related CMP authorizations and government contract numbers.

2 Any acceptable alternates in type, finish, composition, and size.

3 A brief, informative description of your intended fabricating methods.

4 A description of the end-use, exact as to product and its service.

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A New Answer to COIL FEEDING *Problems*

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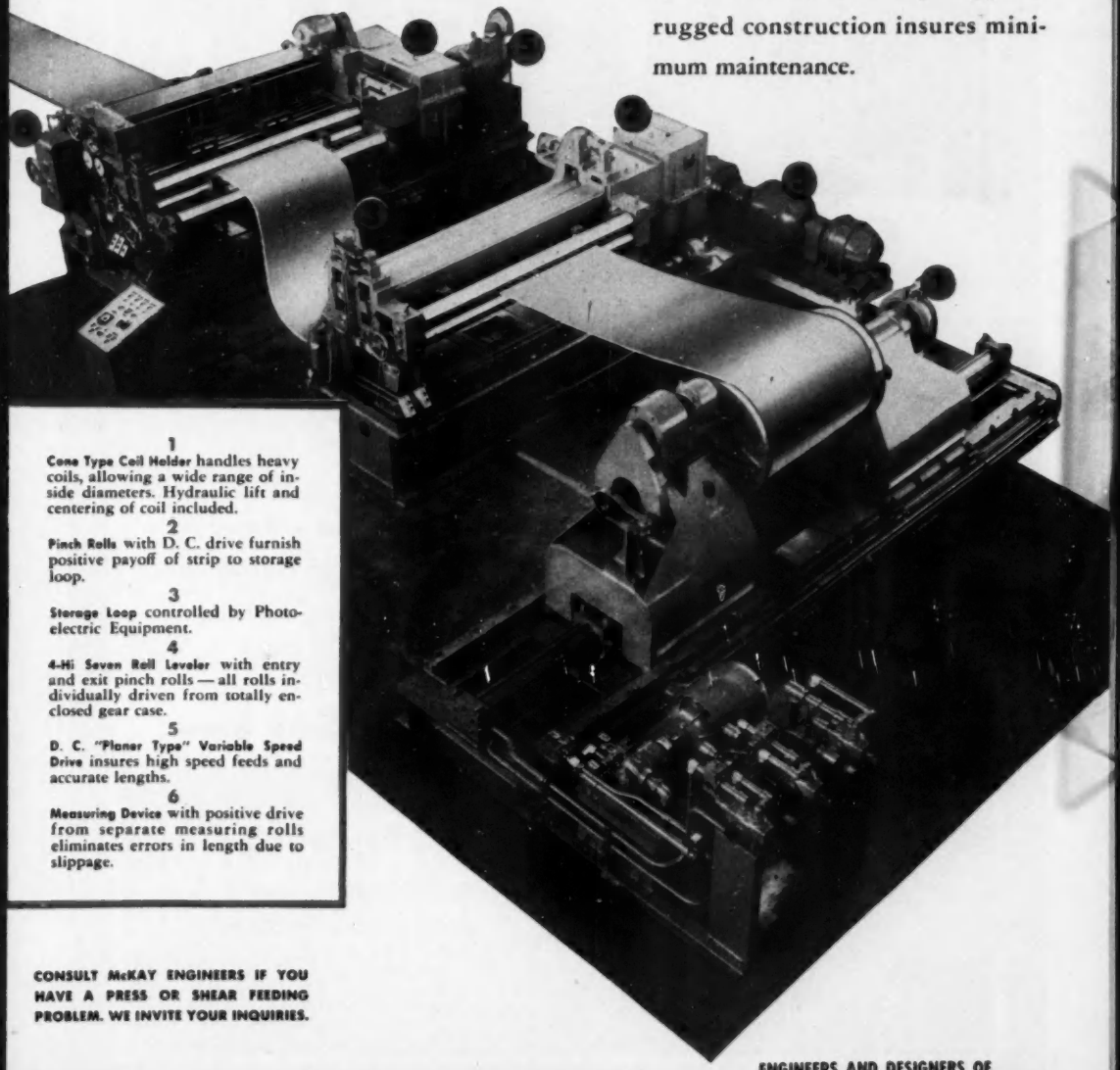

1
Cone Type Coil Holder handles heavy coils, allowing a wide range of inside diameters. Hydraulic lift and centering of coil included.

2
Pinch Rolls with D. C. drive furnish positive payoff of strip to storage loop.

3
Storage Loop controlled by Photoelectric Equipment.

4
4-Hi Seven Roll Leveler with entry and exit pinch rolls — all rolls individually driven from totally enclosed gear case.

5
D. C. "Planer Type" Variable Speed Drive insures high speed feeds and accurate lengths.

6
Measuring Device with positive drive from separate measuring rolls eliminates errors in length due to slippage.

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YOUNGSTOWN, OHIO

The Crankshaft
—backbone of the internal combustion engine.

Modern Trends—more r.p.m.'s, higher compression ratios, more power per cubic inch of displacement—all lend additional emphasis to the importance of crankshaft quality.

Wyman-Gordon Experience—the most extensive in the industry, assures the maximum in physical properties, uniform machinability, and balance control.

Standard of the Industry for More Than Sixty Years

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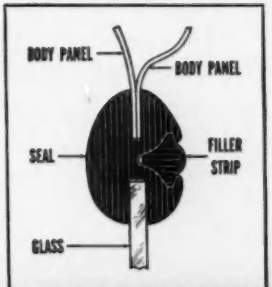
Windshields, like ships at sea, "take water over the bow"

Driving into the teeth of a slashing rainstorm at fifty miles an hour, a windshield takes terrific water impact! And yet, if it's sealed with Inland Self-Sealing Weather Strip, it *won't* leak. It *can't!*

Inland Self-Sealing Weather Strip employs a radically *different* principle. In place of cements and other binders, which inevitably break down, Inland Strip uses the natural resilience of rubber, permanently compressed, to effect the seal. Weatherproofing is *complete* and *permanent!* And, with Inland Strip, installation is a fast, low-cost, one-man operation.

Design and build your vehicles to use Inland Self-Sealing Weather Strip in windshields and fixed windows . . . for the long-range satisfaction and economy of users!

INLAND MANUFACTURING DIVISION
General Motors Corporation, Dayton, Ohio



Easy, Fast, Economical!

The seal goes into the body panel, the glass into the seal, and the filler strip into the locking channel. That's all . . . a fast, low-cost, one-man job . . . done once . . . for permanent weatherproofing!

INLAND MANUFACTURING

Self-Sealing Weather Strip

(PATENTED)

EATON
Zero-Lash
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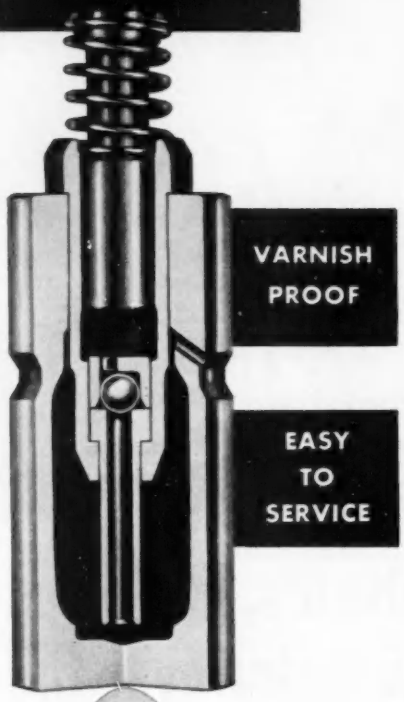
HYDRAULIC VALVE LIFTERS

—are engineered to automatically and positively maintain zero clearance in the valve train at all times



Zero clearance permits better cam design for optimum engine performance • Silent valve train operation • Smoother idling • The Eaton design eliminates efficiency impairment from varnish and sludge • Provides perfect tappet adjustment for the life of the engine under all engine operating temperature extremes.

EATON MANUFACTURING COMPANY
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SAGINAW DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

Have you an ASSEMBLY problem that Black & Decker can solve?

TAP IT with a B&D TAPGUN. Cuts threads up to ¼" in mild steel, up to ⅜" in brass or aluminum. Automatic reversing mechanism greatly reduces tap breakage.

DRILL IT with a B&D ¼" HOLGUN. Drills holes up to ¼" diam. in steel, up to ½" in hardwood. Close-coupled, compact, only ¼" spindle offset.

DRIVE IT with a B&D SCRUGUN. Drives machine screws to ¼", self-tapping screws to #12, wood screws to #10 x 2". Positive or adjustable clutch. 90° Angle model works in close quarters. Handle "free" or "gathering" assemblies.

See how B&D HOLGUNS*, TAPGUNS*, SCRUGUNS* can speed up your work!

What a team these famous *matched* Black & Decker "Power Triplets" make for speeding up assembly work! Their compact, balanced design, "Pistol Grip and Trigger Switch" make them easier to handle, less tiring to use, gets them into hard-to-reach spots. Their powerful B&D-built motors, tailor-made for each tool, mean non-stop performance. Their top-notch engineering insures more accurate, more uniform work, fewer rejects, lower costs. Their extra-tough gears, shaft and chuck spindles and husky housings give you extra years of service to cut tooling costs. See your nearby B&D Distributor for expert help in tooling problems. Write for free catalog to: THE BLACK & DECKER MFG. CO., 635 Pennsylvania Ave., Towson 4, Md.

*Trade Mark Reg. U. S. Pat. Off.

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PORTABLE ELECTRIC TOOLS

WORLD'S LARGEST, MOST COMPLETE LINE

Silicone Rubber Parts

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Stock Number	Durometer Shore A Scale	Tensile Strength (p.s.i.) Avg.	Tensile Strength (p.s.i.) Min.	Elongation at Break Avg.	Elongation at Break Min.	Temperature Range (°F) Low	Temperature Range (°F) High	Compression Set % at 350° F.	Dielectric Strength volts/mil	Color (Std. Color Coding)
*Silastic 130	45 to 55	360	>250	200	>200	<−70	+500	40 to 60	300	White
160	55 to 65	490	>400	180	>150	<−70	+500	50 to 70	500	White
180	75 to 85	700	>575	85	>60	−90	+500	70 to 90	600	White
181	75 to 85	670	>550	85	>60	−80	+500	80 to 90	800	Grey
6-181	75 to 85	680	>500	65	>50	<−110	+500	40 to 60	550	Grey
250	40 to 50	680	>550	300	>250	<−110	+500	40 to 60	550	Orange-tan
**G-E 81223	40±5		800		400	−85	+520	65 to 75	480	†
**G-E 81271	50±5		800		250	−85	+520	65 to 75		†

*Registered Trade-Mark of the Dow Corning Corporation.
**Specifications listed for this stock are based on cure of 24 hrs./400° F.
†General Electric silicone rubber can be tinted in a choice of colors.

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STALWART is prepared to mold, extrude, punch, and lathe-cut precision SILICONE parts engineered to meet individual requirements as well as S.A.E. and A.S.T.M. specifications.

Write today for the new 16-page, illustrated catalog Number 51SR-1 for additional details.

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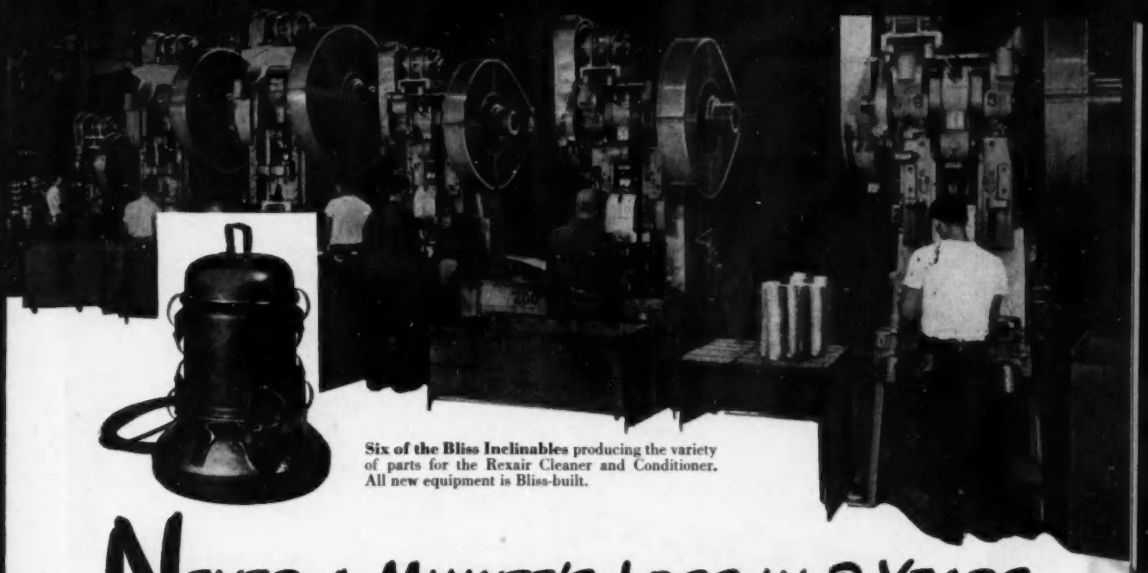
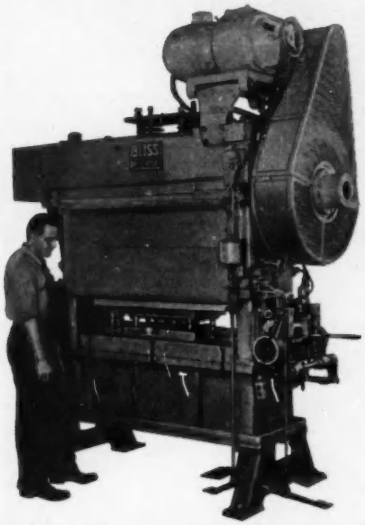


Six of the Bliss Inclinables producing the variety of parts for the Rexair Cleaner and Conditioner. All new equipment is Bliss-built.

NEVER A MINUTE'S LOSS IN 2 YEARS

Stamping Rexair Cleaners and Conditioners



All the motor laminations used by Rexair are produced on this #645-D Bliss High Production Press.

"One or Several Copies Are Needed in Any Shop Doing Stamping Work"...*American Machinist*

Completely New

700 Pages • 450 Illustrations

Sections on: Computing press jobs • Selecting proper press • Useful engineering tables • Die illustrations • Complete glossary. Plus a service section for Bliss presses.

$7.50

E. W. BLISS COMPANY—Handbook Dept., Canton, Ohio

Ten Bliss Inclinable presses and a Bliss High Production press equipped the Rexair Division of Martin-Parry Corporation to meet all stamping requirements on a high-volume, low-cost manufacturing basis. Die cushions were built into several presses to accommodate necessary drawing operations and to give Rexair greater versatility in its press room.

"Since the Bliss presses started operating about two years ago, we've never had a minute's production loss," says Les Johnson, Rexair's plant superintendent. The High Production press delivers an average of 8,600 perfect laminations per hour, running well within its capacity.

Bliss-Marquette Die Cushions are credited by Don Crane, press department foreman, for part of the long die life on the Inclinables producing separators, water pan bottoms and inspection plates. The pneumatic cushions exert a constant pressure throughout the entire stroke, and are used for drawing work that would not be possible with spring cushions, while at the same time eliminating the excessive pressures which cause wear and tear on dies.

Whatever your stamping problems, Bliss engineers can render valuable service in recommending equipment precisely suited to a given set of production conditions.

E. W. BLISS COMPANY, CANTON, OHIO

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

Inspection Plate—22-gauge steel, 6⅞" dia., 1⅝" drawn and formed—400 per hour.

Water Pan Bottom—.024 steel, 10½" dia., 1½" drawn and formed—356 per hour.

Separator—18-gauge aluminum, 4¼" dia., 1⅛" drawn and formed—514 per hour.

Fan Shroud (left)—24-gauge aluminum, 5½" dia., 1" drawn and formed—751 per hour.

Eddy Plate (right)—24-gauge aluminum, 5½" dia., 1" drawn and formed—751 per hour.

Motor Laminations—.018 steel, 2" dia., 3¾" dia., average 8,600 hourly production with progressive die.

From a single press for a given job... to a complete press room... **It's Bliss**

"Think they'll still run on gas in 1960?"
It's anybody's guess whether 1960 cars will be jet propelled, atomic-powered, or still running on gasoline. One thing is certain, though—these future cars will be *better* cars! They'll be safer . . . more comfortable . . . more efficient.
Why? Because, among other reasons, 1960 cars will have improved *castings*. Improvements are being made right now in the design of *cast* camshafts, cylinder blocks and heads, and pistons. They are being given greater strength, more wear resistance, and better machinability through developments by the largest independent contracting foundry in the world—Campbell, Wyant and Cannon—*where advanced metallurgical engineering, precision control, and mechanized production assure the highest quality castings at lowest cost.*
CAMPBELL, WYANT AND CANNON FOUNDRY COMPANY . . . SERVING THE AUTOMOTIVE, FARM EQUIPMENT, RAILROAD AND MARINE INDUSTRIES AND THE ARMED FORCES
CAST CYLINDER HEADS AND BLOCKS
CAST PISTONS
CAST CAMSHAFTS
CAST CRANKSHAFTS
CAST GEARS
CENTRIFUGALLY CAST CYLINDER LINERS
CENTRIFUSE BRAKE DRUMS
CAMPBELL, WYANT AND CANNON FOUNDRY COMPANY
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BI-METAL BEARINGS

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Six manufacturing plants, each specializing within a specific range of alloys and sizes, produce millions of pieces each month. Quality control to meet your manufacturing standards.

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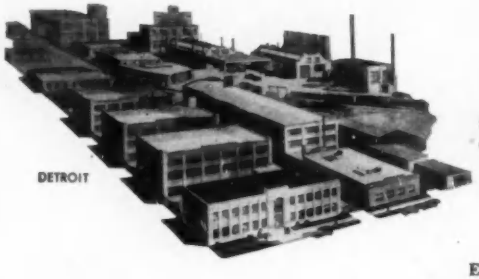

DETROIT

ANAHEIM, CALIFORNIA

Illustrated above are Rinshed-Mason's 37 building units at Detroit and Anaheim, California, consisting of office, factory and laboratory facilities. Not shown are field exposure test facilities at Miami, Florida.

Established in 1919, Rinshed-Mason is one of America's leading manufacturers of fine quality lacquers, enamels and undercoats for automobiles, farm equipment, appliances, and numerous other peacetime industrial products. Beyond this, versatile laboratory and production facilities are available to meet defense requirements for protective and other coatings.

Rinshed-Mason Co.

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DETROIT 10, MICH.

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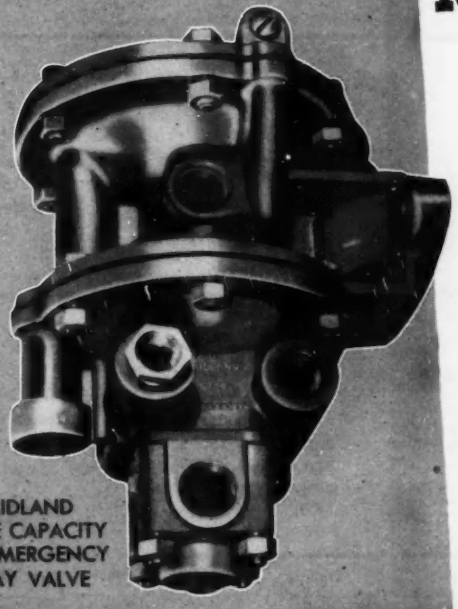
REG. U.S. PAT. OFF.

1244 N. LEMON ST.
ANAHEIM, CALIF.

MAXIMUM SPEED and POWER for GREATER BRAKING EFFICIENCY

MIDLAND AUTOMATIC "EMERGENCY" VACUUM RELAY VALVE



MIDLAND LARGE CAPACITY AIR EMERGENCY RELAY VALVE

MIDLAND'S AUTOMATIC "EMERGENCY" VACUUM Relay Valve

A Midland innovation providing maximum braking in one-third the time. A combination 4-in-1 unit. Greatly advanced in design and operating features.

- Built-in fast action tank valve.
- Built-in open type trailer check valve.
- Built-in automatic emergency brake application.
- Integral moisture trap, drain cock and air cleaner.

MIDLAND'S LARGE CAPACITY AIR Emergency Relay Valve

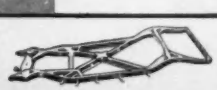
For greater safety of operation. Offers automatic brake application on the trailer when parked, or in case of trailer breakaway. Extremely rapid application with perfect synchronization between service (control) line and brake chamber pressures.

See Midland Distributor, or write or phone to us in Detroit for complete details.

The **MIDLAND**
STEEL PRODUCTS COMPANY
6660 Mt. Elliott Ave. • Detroit 11, Mich.
Export Department: 39 Pearl Street, New York, N. Y.

Air and Vacuum POWER BRAKES

World's Largest Manufacturer of AUTOMOBILE and TRUCK FRAMES



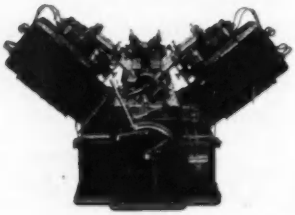
Air and Electro-Pneumatic DOOR CONTROLS

- **BETTER VALVE SEATS** — faster with **WATERBURY-HALL** grinders
- **COMPLETE LINE** production type and service shop equipment
- **ENGINEERING** facilities for your valve seat grinding problems

WATERBURY-HALL

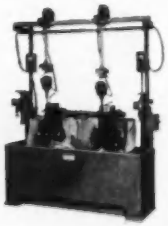
Specialists in

VALVE SEAT GRINDING



AUTOMOTIVE

Waterbury-Hall Multiple Spindle Grinder as used for production grinding of valve seats by Ford, Chrysler, GM, Willys, International Harvester, Cummins and other leading engine builders.



AVIATION

Waterbury-Hall Aircraft Seat Grinder as used for production and service on aircraft engines by Continental, Lycoming, U.S.A.F., leading airlines such as Capitol, American, United and others.

DIESEL

Waterbury-Hall Diesel Type Seat Grinder as used for production and service on diesel engines by American Locomotive, Baldwin, New York Central RR, New Haven RR, U. S. Navy and others.

WATERBURY TOOL DIVISION VICKERS INCORPORATED A SUBSIDIARY OF THE SPERRY CORPORATION **160 AURORA ST., WATERBURY 20, CONN.**

Call on Morse

for better timing drive performance

It almost goes without saying that Morse makes the finest timing drives available today. For Morse Timing Drives give you greater design and manufacturing freedom, save assembly time. And, of course, Morse Timing Drives perform better, longer, more quietly; give efficient, trouble-free service.

What's more, Morse stands ready to help you get the performance *inherent* in Morse Timing Drives. We offer our engineering and design assistance, based on forty years of timing drive leadership and close cooperation with automotive engineers.

Have our engineers review your present timing drive situation or make recommendations for timing drives on your engines now in the planning stage. Write us today for more information.

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Dept. 172, 7601 Central Ave., Detroit 8, Michigan

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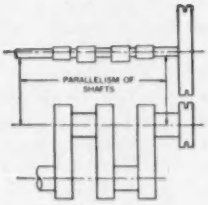
Morse *means* Timing Chains

MORSE
MECHANICAL
POWER TRANSMISSION
PRODUCTS

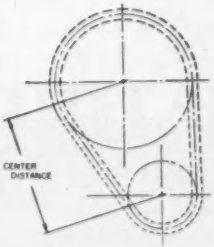
PRODUCTS OF B-W BORG-WARNER

Four major advantages of Morse Timing Drives

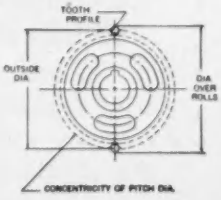
Morse Timing Drives maintain accurate and positive timing despite end-play of shafts.



Morse Timing Drives assure safe, quiet performance though camshafts and crankshafts are not exactly parallel.



Morse Timing Drives permit greater engine block tolerances and economical production because of increased center distance tolerance on drive.



Morse Timing Drives permit greater manufacturing tolerances on sprockets, therefore allow the production of a complete drive under the most favorable and economical conditions.

Since 1932 . . .

more than 60,000,000 K. S. Electric Telegages (water temperature, fuel level and oil pressure) have been produced for the keenly competitive, highly critical automotive market.

To maintain this leadership and progressively improve these instruments King-Seeley carries on a consistent program of engineering research and development. Among these improvements is the design change which enables the Telegage to withstand continuous vibration in two planes for eight hours at vibration rates ranging from 0 to 4,000 per minute.

Another is the introduction of spun glass insulation for heater wires to protect the circuit against damage from current surges and shorts.

Still another is compensation for voltage variation. Such variation may range from 5 to 9 volts without interfering with the accurate performance of the Telegage.

For the last five years King-Seeley has operated under a carefully organized Quality Control System which has materially improved the standards of workmanship and the uniformity of Telegages.

Besides the conventional inspections all tank unit diaphragm stock is tested to 1,000,000 cycles and stock for oil pressure diaphragms to 10,000,000 cycles. All stock has to pass these tests to be accepted.

As Research discovers better designs, better manufacturing methods and better materials, these also will be incorporated in the K. S. Telegage.

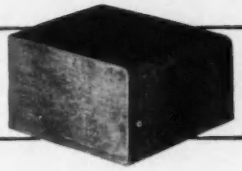
KING-SEELEY CORPORATION
ANN ARBOR, MICHIGAN
PLANTS AT ANN ARBOR, SCIO, AND YPSILANTI

SAVE STEEL . . . MANPOWER . . . MACHINING WITH

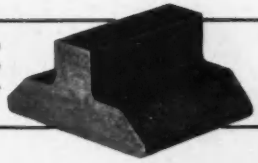
DISSTON® HOT ROLLED SHAPES

How Firestone Tire & Rubber Company saves 45.2% steel in making special jet engine container rims:

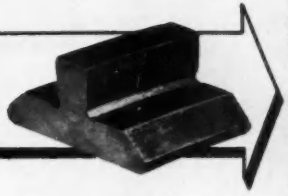
INSTEAD OF THIS—a full-section steel bar weighing 9.86 lbs. a ft....



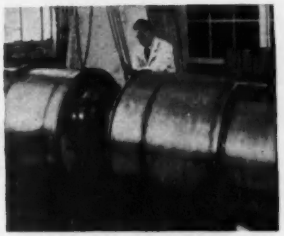
THEY* START WITH THIS—a Disston Shape, hot-rolled to close tolerances, weighing only 5.4 lbs. a ft....



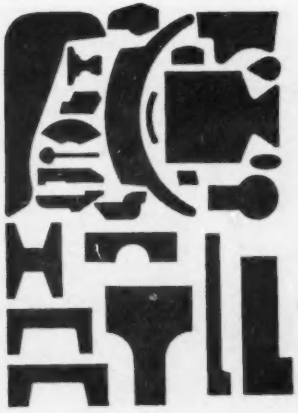
TO MAKE THIS—the finished rim weighing 4.14 lbs. a ft. Only 1.26 lbs. need be machined off each ft. of metal instead of 5.72 lbs.!



*Machining and rim fabrication by Dresser Manufacturing Div., Bradford, Pa.



Firestone's jet engine container is in two halves which are attached by a series of clamps affixed to a machined rim. This rim is made from a special Disston Hot Rolled Steel Shape and helps make a joint capable of carrying structural loads.



A few of the many forms of Disston Hot Rolled Shapes now being used by industry.

This actual case history demonstrates typical savings made for many industries using Disston Hot Rolled Steel Shapes. Such shapes can be rolled in a variety of forms to meet exact specifications. Tolerances are close, and fine finishes can be furnished. These shapes can be made in either alloy or carbon steels, in both electric and open hearth grades. Disston engineers and metallurgists will be glad to work with you in developing the special shapes that will give you the greatest economies. Write us, specifying your needs.

FIGHT WASTE

SCRAP TURNED IN IS STEEL TURNED OUT!

Steel mills urgently need more scrap *now!* Help yourself get more steel by keeping your scrap moving into channels serving steel mills.

HENRY DISSTON & SONS, INC.

731 Tacony, Philadelphia 35, Pa., U.S.A.

Would You Specify

A JOINT that forces your truck to carry 28 pounds of unnecessary DEADWEIGHT

OR

A JOINT that permits your truck to carry 28 pounds of extra PAYLOAD each trip

Help avoid Over-Weight penalties —

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With 34% Lighter

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For information that will help your truck carry 11,200,000 pounds of EXTRA payload during its normal life — Write MECHANICS UNIVERSAL JOINT DIVISION — Borg-Warner, 2024 Harrison Ave., Rockford, Ill.

No Place for a Cracked Casting!

Inspecting castings under black light with automatic ZA-19 Zyglo Unit

How "CATERPILLAR"

- Gets Better Castings
- Eliminates Wasted Machining on Defective Castings
- Insures Unfailing Safety

USING AUTOMATIC CONVEYORIZED ZYGLO*

There's no place in "Caterpillar" machines for parts that may fail prematurely.

To safeguard the quality of its malleable castings Caterpillar Tractor Co. has for years used Magnaflux* and Zyglo* for receiving inspection. Lately a big, automatic ZA-19 Zyglo Unit has been added to provide highest speed inspection of a wide variety of castings.

By spotting defective castings *before* machining, this Zyglo Unit has substantially reduced machining time and costs. It is improving quality by revealing defects caused by variables in casting and enabling correction of foundry methods. Finally, it insures that no defective casting will find its way into a "Caterpillar" unit.

The Zyglo inspection is fast, simple and positive. Conveying and processing of castings and application of Zyglo fluorescent penetrant are fully automatic. The penetrant enters every crack or porosity defect. Then in the Zyglo inspection booth these defects are instantly revealed under black light as glowing indications.

Whether or not your inspection needs are like those of "Caterpillar", Zyglo or Magnaflux Magnetic Particle Inspection can in all probability give you similar savings and improved quality control. Ask an expert Magnaflux engineer to sit in with you soon.

Write for booklets on Zyglo and Magnaflux.

** Magnaflux and Zyglo are U. S. Registered Trademarks of Magnaflux Corporation.*

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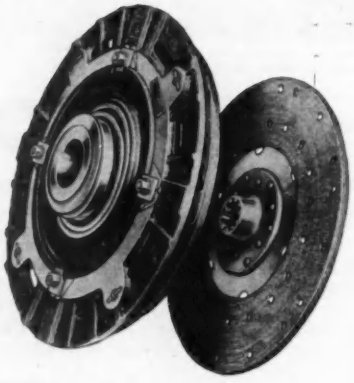
NEW YORK 18 • CLEVELAND 15 • DETROIT 11 • DALLAS 9 • LOS ANGELES 58

Export Distributor: Curtis Wright Corp. *In Canada:* Williams & Wilson, Ltd.



A LIPE MULTI-LEVER CLUTCH GIVES MORE ENGAGEMENTS BETWEEN TEAR-DOWNS. The reason is plain. There's only one spring. Pressure is evenly distributed all around the pressure plate by 20 pressure-equalizing levers. Every part of the pressure plate touches at the *same instant* . . . with the *same pressure.* There's no cocking of the plate, no high spots—no localized burning. The clutch engages smoothly without babying; holds without slippage in final engagement.

●

Write for Service Manual and complete data on genuine Lipe parts—stocked in principal cities.

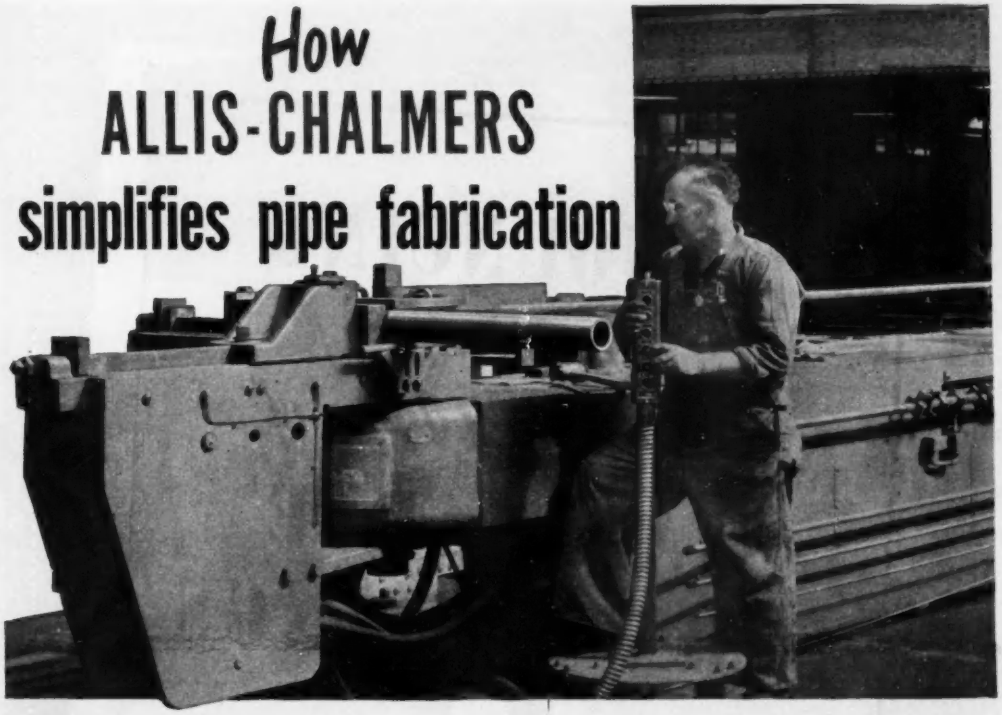
LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION

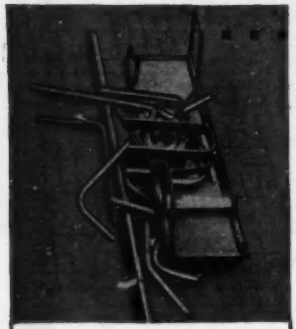
Manufacturers of Automotive Clutches and Machine Tools

Syracuse 1, N. Y.

How ALLIS-CHALMERS simplifies pipe fabrication

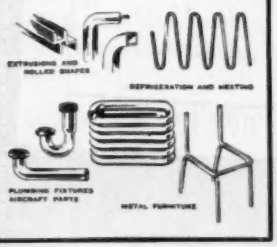


with a PINES AUTOMATIC BENDER



View of small lot bending jobs performed on Pines Size 4 Automatic Bender. Smooth, accurate bends are formed without wrinkles or distortion.

OTHER TYPICAL PINES BENDING JOBS
There's a complete range of Pines Benders designed to profitably handle jobs like these.



Cold Bending Eliminates Costly Pickling Operation

In a centralized pipe fabricating division at the Allis-Chalmers West Allis Works, a wide range of cold bending jobs for production and maintenance needs are now efficiently handled on this Pines Hydraulic Automatic Bender. The machine has ample capacity for handling requirements for pipe and tubing ranging in sizes from 3/4″ thru 5″. The cold bending principle of the machine, combined with push-button control and automatic operation, reduces manual effort, and cuts costs. *For example,* in place of hot bending, long lengths of 3″ oil line piping are now cold formed at speeds five times more efficient. In addition, a costly cleaning and pickling operation is avoided.

Small Lots Handled Profitably—Low Tooling Expense

Further, most small lot jobs are handled profitably. The centralized operation permits standardizing on radii of bends which lowers tooling expense. Simplicity of tooling and quick change-over features of the machine saves set-up time. The capacity and versatility of the equipment also permits handling all types of materials and shapes suitable to cold bending, such as stainless steel and chrome-moly tubing, extra heavy wall piping, channel iron, extruded and structural shapes. Thus, with modernized equipment and skillful engineering, fabricating and assembly work at A-C are greatly simplified.

PINES ENGINEERING CO., INC.

Write FOR MORE FACTS TODAY

Find out how Pines Benders may be tooled for your work. Free catalog shows various models and tooling applications on actual jobs.

Specialists in Tube Fabricating Machinery

653 WALNUT • AURORA, ILLINOIS

BENDING • DEBURRING • CHAMFERING • THREADING • CUT-OFF MACHINERY

ANNOUNCING

The Reopening of
A Major Producer of

MALLEABLE IRON CASTINGS

FORT PITT of McKees Rocks, Pa., for more than half a century a leading U. S. producer of high quality Malleable Iron Castings, is again in operation. This foundry is now in a position to fill your orders on a prompt delivery schedule.

Immediate contact with our sales department is urged in order to assure an early and continuous supply to your production lines.

Inquiries will be handled on a "first come first served" basis in the order in which they are received. Direct your inquiries to . . .

FORT PITT MALLEABLE IRON DIVISION

Steel Trading Corporation

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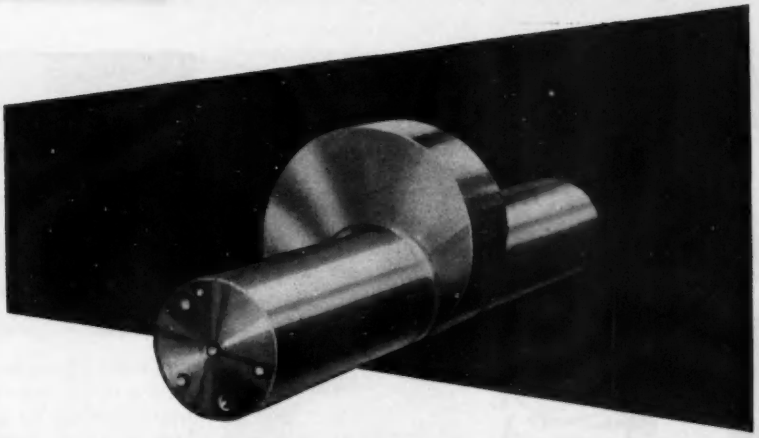
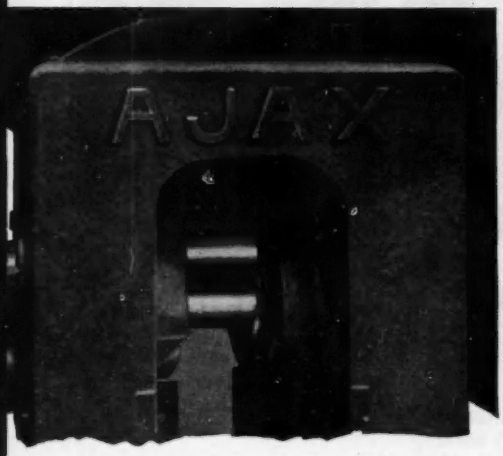
FOR 50 YEARS A DEPENDABLE PRODUCER OF MALLEABLE IRON CASTINGS.



HIGH FATIGUE RESISTANCE



The excellent quality of the heat-treated alloy steel used in the main shaft of an AJAX High Speed Forging Press insures high fatigue resistance.

Another example of the care exercised by AJAX engineers in specifying the finest materials obtainable to insure dependable performance and fine, quality products at low cost.

Write for Bulletin 75B

THE Ajax MANUFACTURING COMPANY

EUCLID BRANCH P. O. CLEVELAND 17, OHIO

1105 DEARBORN ST. CHICAGO 3, ILLINOIS

DEWART BUILDING NEW LONDON, CONN.

What makes the plate ship-shape?

...a brush! Ask this shipyard worker. He knows that for top quality joints, steel plates should be free of rust and dirt before welding and he knows the way to clean them *fast* is with Osborn power brushes.

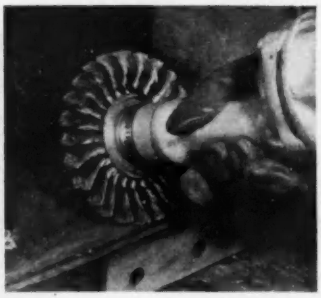
The world's leaders in this field are Osborn Disc-Center* Wire Wheel Brushes and Wire Cup Brushes. These rugged tools clean parts prior to welding. And they clean slag and weld spatter from joints after welding. Their high-speed, efficient operation gets the jobs done quickly . . . saves precious man-hours!

Fabrication cleaning is only one of many places where you can save time and improve products with power brushing. The **O**sborn **B**rushing **A**nalyst will gladly survey your *cleaning* and *finishing* operations to help you. Call or write *The Osborn Manufacturing Company, Dept. 483, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

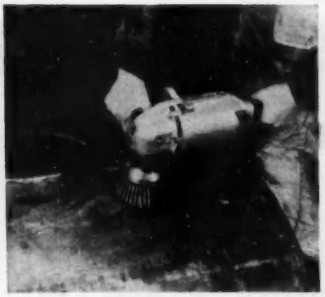
*Trademark

OSBORN

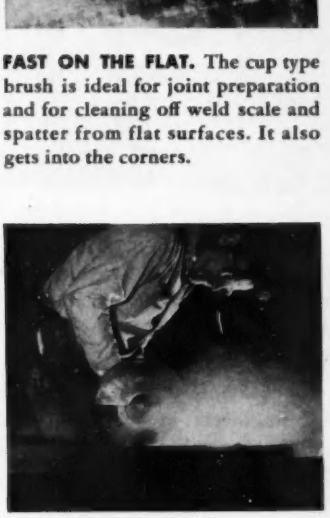
LOOK FOR THE NAME OSBORN...RECOGNIZED EVERYWHERE FOR QUALITY WORKMANSHIP AND MATERIALS



GETS INTO CORNERS. This type of Osborn Disc-Center Wire Wheel Brush is popular for general fabrication. It digs into simple corners of fillets . . . and into the grooves and pits of welds.



FAST ON THE FLAT. The cup type brush is ideal for joint preparation and for cleaning off weld scale and spatter from flat surfaces. It also gets into the corners.

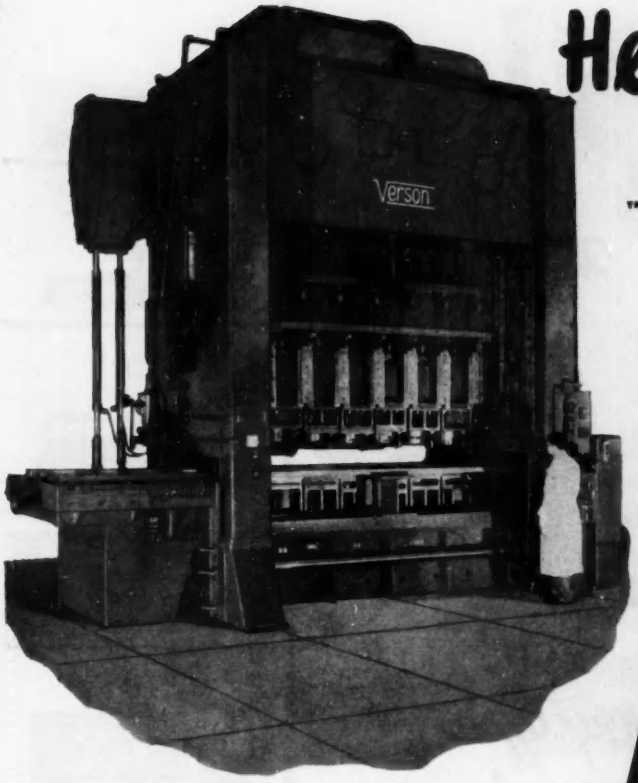


CLEAN-UP JOBS are handled fast with the Osborn Monitor® Wire Wheel Brush. Its narrow face makes it an efficient tool for getting into confined areas to remove rust, grit, old paint.

Here's what

TRADE **Verson** MARK

TRANSMAT PRESSES will do for you . . .



Illustrated is a 250 ton Verson TRANSMAT Press used by a leading manufacturer of automotive parts for making sealed beam headlight mounting rings. Developed blanks are fed by a Verson Automatic Stack Feed and six operations are performed. Production is 1100 pieces per hour.

- ✓ Eliminate handling, pickling, and annealing between operations
- ✓ Provide greater uniformity
- ✓ Minimize rejects
- ✓ Conserve floor space
- ✓ Free operators for other jobs
- ✓ Minimize scrap loss
- ✓ Reduce maintenance

Since the first Verson TRANSMAT Press was made, over ten years ago, owners have found that these machines are unmatched as cost-cutters where production requirements are high. With the TRANSMAT it is possible to *automatically* draw, form, punch and trim parts from developed blanks or from coil stock, whichever affords the greater scrap economy. As many as ten operations are being performed without intermediate handling . . . one press and one operator doing the work of several in a minimum amount of space. Automatic feeding puts an end to the human errors that accompany hand feeding. Maintenance is limited to a single machine instead of several. Further, the use of TRANSMAT Presses is no longer limited to symmetrical or cylindrical parts. Rectangular and non-concentric parts can and have been successfully produced on TRANSMATS.

If you are a continuous every-day producer of metal stampings in large quantities, we would like to explain the economical advantages of Verson TRANSMAT Presses and Verson Dies. Call us, today.

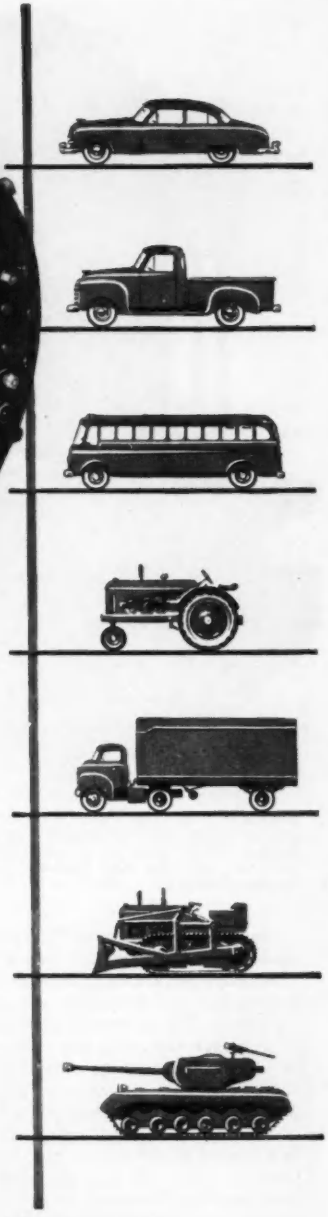
Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

9307 South Kenwood Avenue, Chicago 19, Illinois — Holmes Street and Ledbetter Drive, Dallas 8, Texas

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP!

BLANKING PRESSES • DRAWING PRESSES • HYDRAULIC PRESSES • HIGH PRODUCTION PRESSES
TRANSMAT PRESSES • PRESS BRAKES • DIES • DIE CUSHIONS • COMPRESSION MOLDING MACHINES



clutches for every type of automotive service

Where smooth power transmission counts most, automotive manufacturers use Long clutches as original equipment.

Since 1921, Long has given capable engineering and manufacturing attention to a wide range of clutch requirements, both civilian and military. We have produced millions of clutch units to equip passenger vehicles, trucks, buses and tractors.

LONG MANUFACTURING DIVISION
Borg-Warner Corporation
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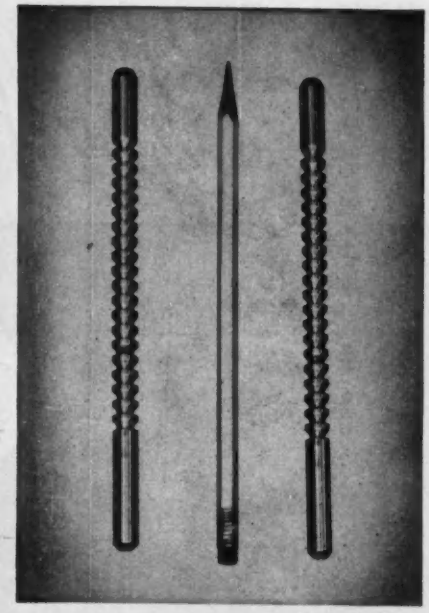
ENGINEERING BW PRODUCTION

LONG
CLUTCHES • RADIATORS • TORQUE CONVERTERS
OIL COOLERS

Perhaps your job calls for a big, husky, man-sized broach like this 76" involute spline broach, built for a leading gear manufacturer.



. . . or maybe you use small broaches . . . like these, for broaching automotive ignition parts.

precision QUALITY in any QUANTITY

with *American* ENGINEERED Broaches

Write today for your copy of Catalog No. 450, 32 pages packed with useful, practical broaching information.

Big. Small. Short. Tall. Two, 200 or 2,000 at a time. When American builds broaches, you can count on this:—A standard of precision that will consistently give you top economy in production . . . a quality that delivers a maximum number of parts between resharpenings . . . and a maximum number of resharpenings for longer broach service life. You can expect these advantages with American-engineered broaches. You get them because American gives you more than twenty-five years experience with broaches, fixtures and machines . . . twenty-five years of close cooperation with manufacturers. Knowing all three, they can engineer to get the most, production-wise, from all three. Why not present your next broaching problem to American for a profitable solution? Send part print or sample and hourly requirements for their obligation-free recommendations. Address Dept. I.

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American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

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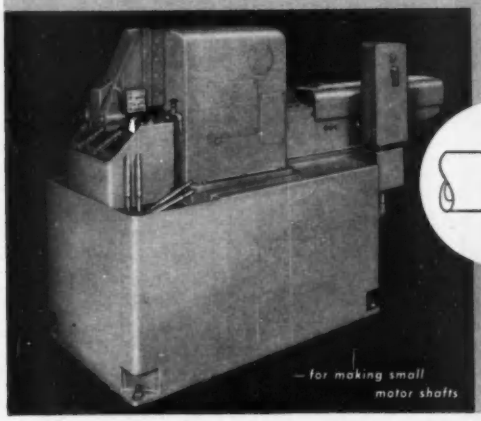
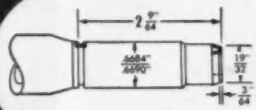
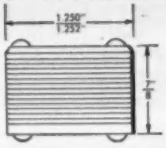
HOPPER LOADING OR BAR FEED
• COMPLETELY AUTOMATIC •
TWO SPINDLES CONTROLLED BY ONE MAIN CAMSHAFT!


—for making small motor shafts



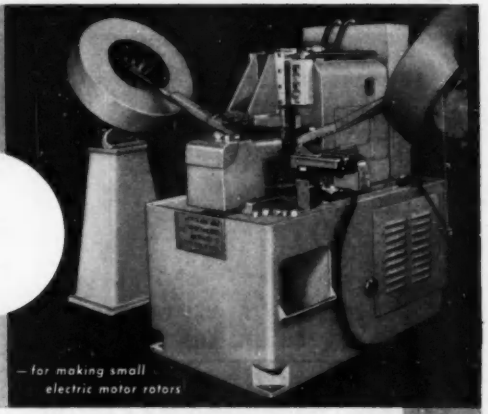
MOTOR SHAFTS

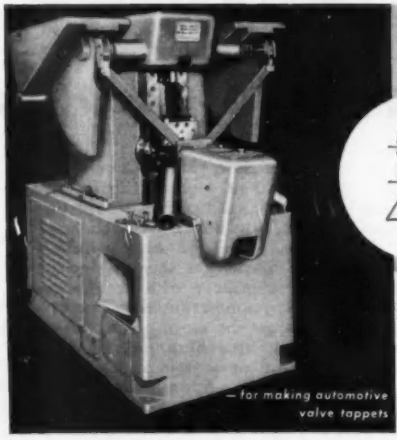
Operation: Turn, neck and chamfer.
Material: Steel tubing.
Production: 1400 pcs/hr. @ 100% efficiency.

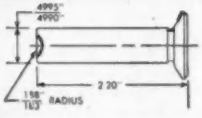


SMALL MOTOR ROTORS

Operation: Turn O. D. and chamfer one end.
Material: Laminated silicon steel.
Production: 800 pcs/hr. @ 100% eff.


—for making small electric motor rotors


—for making automotive valve tappets



VALVE TAPPETS

Operation: Radius, neck and chamfer.
Material: 5120 steel.
Production: 2400 pcs/hr. @ 100% efficiency.

Stock feed, loading and locating mechanisms, collets and feeds of tool slides are controlled mechanically by a single camshaft —*simplicity itself.* M. & M. cam automatics require minimum attention and only occasional checking of work-pieces. If you will submit your drawings and specifications, we will tell you how Motch & Merryweather cam automatics can increase your *production with accuracy.*

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ONE OF THE NATION'S
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PRODUCTION FOUNDRIES

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ESTABLISHED 1866

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FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

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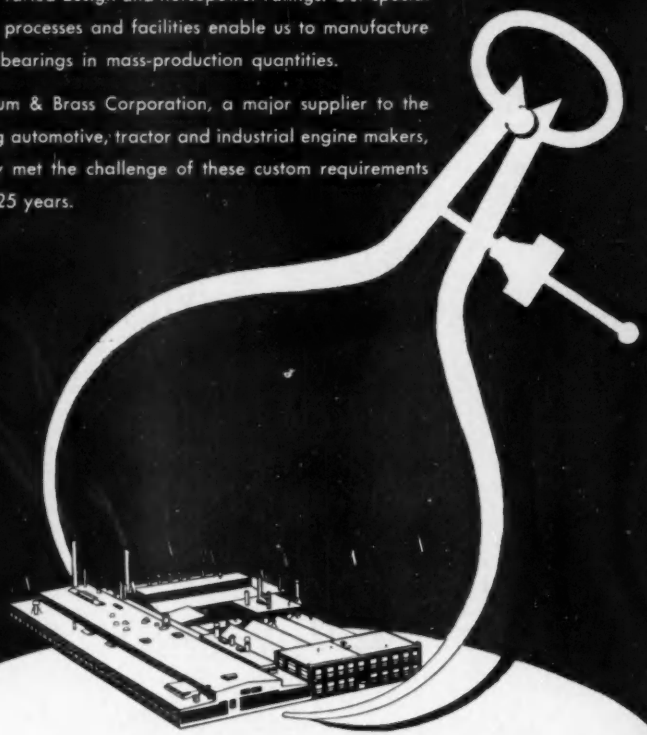
PROBLEMS of bearing-load and bearing-life differ with engines of varied design and horsepower ratings. Our special skills, exclusive processes and facilities enable us to manufacture custom-quality bearings in mass-production quantities.

Detroit Aluminum & Brass Corporation, a major supplier to the nation's leading automotive, tractor and industrial engine makers, has consistently met the challenge of these custom requirements for more than 25 years.



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No. 2-20 Milling Machine
Table, 42" x 12"
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You can score a "bullseye" in *high production with precision* . . . by putting the work on Kent-Owens Milling Machines!

Shop records show there's steady output without costly downtime with Kent-Owens Machines. Designed for rapid, easy set-up and operation. Efficient . . . rugged . . . dependable . . . with practical features that save job-time and labor. Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with special machine requirements. Kent-Owens Machine Co., Toledo, Ohio.

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DAYTON
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now you can get the new

GROOVE GUARD

in heavy-duty pistons of

ALCOA LO-EX ALLOY

METALLIC-BONDED IRON INSERT MINIMIZES TOP GROOVE WEAR

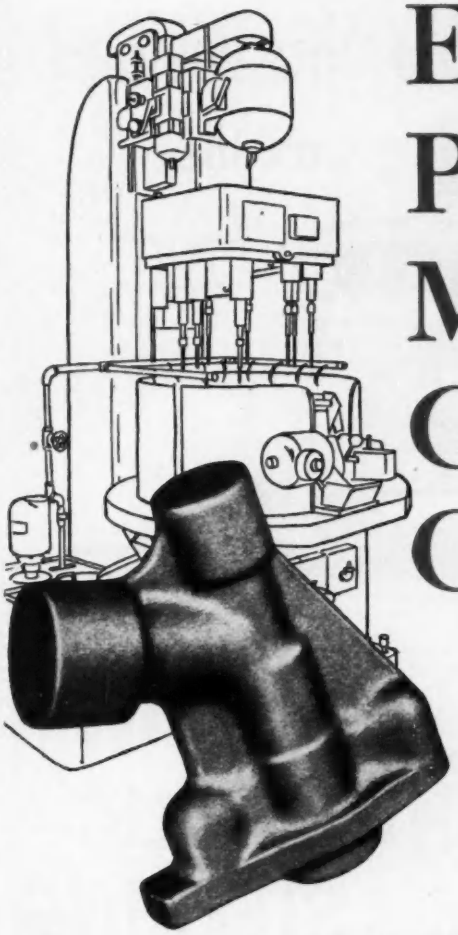
If you have ring groove wear in heavy-duty aluminum alloy pistons, Alcoa has the answer—the new *Groove Guard!*

This special iron insert is cast right into the aluminum piston, and is held firmly in place by a solid metallic bond and its own keystone shape. It helps to maintain proper clearances at high temperatures. Stops waste of fuel and compression that can result from worn grooves.

Now, add the Groove Guard to other advantages you get with pistons of ALCOA LO-EX ALLOY—light weight, high strength, low expansion, fast heat transfer. Rearmament needs may restrict availability of aluminum pistons, but ask your piston supplier about this important new development and its availability. Or write ALUMINUM COMPANY OF AMERICA, 1841G Gulf Building, Pittsburgh 19, Pennsylvania.

MORE HAUL PER OVERHAUL!

PISTON CASTINGS OF EVERY TYPE... *by Alcoa*



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HIGH PRESSURE CONTROL MECHANISMS

- **Free machinability**
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- **Machines to high, mirror-like finish**
- **Properly annealed; no growth or distortion after machining**

Send for your copy of the illustrated booklet, "A Quick Picture of the Eaton Permanent Mold Process for Producing Gray Iron Castings."

EATON MANUFACTURING COMPANY

CLEVELAND, OHIO

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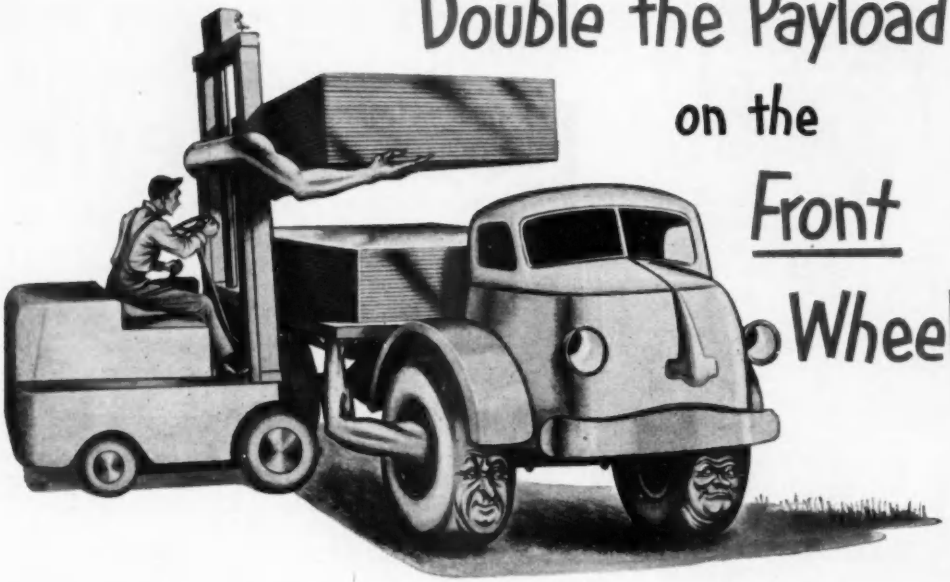
PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

Double the Payload on the Front Wheels



The trucks that satisfy truck buyers today are trucks with front axles that do their full share of the work . . . front axles that mean bigger payloads and more profits for fleet operators.

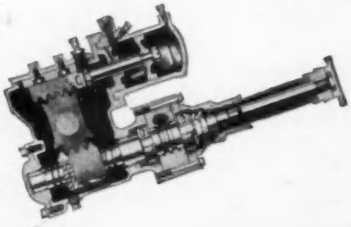
And that's where Saginaw Hydraulic Steering comes in. Saginaw's new hydraulic power steering gear permits up to *double* the usual front axle payload . . . brings easier, safer steering *plus* new payload profits. And it does this with no increase in truck size . . . no danger of exceeding legal load limits.

Built by the largest manufacturer of steering equipment in the world, Saginaw Hydraulic Steering has an outstanding record of efficient, trouble-free operation behind it.

Find out how Saginaw Hydraulic Steering can boost the payload potential on your trucks . . . help you to *sell* more trucks. Write us for the complete details.

IF IT'S EASY TO STEER IT'S A SAGINAW GEAR

with SAGINAW HYDRAULIC STEERING



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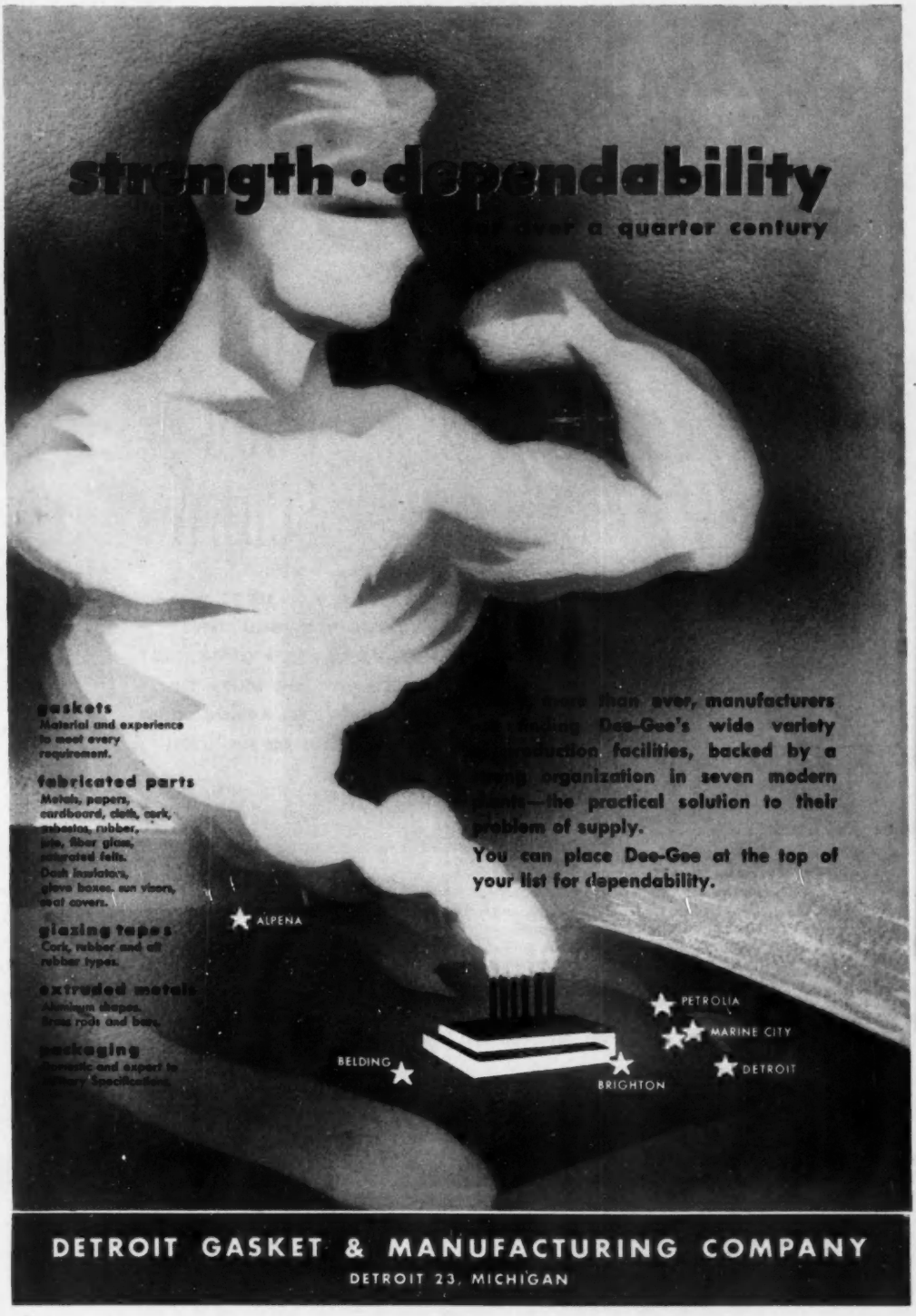
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Material and experience to meet every requirement.
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Metals, papers, cardboard, cloth, cork, asbestos, rubber, jute, fiber glass, saturated felts. Dash insulators, glove boxes, sun visors, seat covers.
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Cork, rubber and all rubber types.
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Aluminum shapes. Brass rods and bars.
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Domestic and export to military specifications.
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Dee-Gee's wide variety
production facilities, backed by a
organization in seven modern
plants—the practical solution to their
problem of supply.
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TO MEDICAL AMPULES

MASTERS OF MARKING — Since 1911

Markem methods, machines, type and inks have been marking the products of industry for forty years. Markem machines can mark up to many thousands of pieces per hour. They make clear, durable imprints on flat, curved or irregular surfaces of paint, paper, wood, glass, metal, leather, plastic, rubber, fabric, composition and pressure sensitive tapes. No special skill is needed for their operation. Legend and color of imprint may be quickly and easily changed.

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When your products need marking for Identification, Control or Market — ask Markem. Submit your problem, together with a sample of the item to be marked. Markem Machine Company, Keene 8, New Hampshire.

MARKEM
BETTER MARKING SINCE 1911

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ARE GOOD SCREWS

WOOD SCREWS • LAG SCREWS
MACHINE SCREWS • SPECIAL SCREWS
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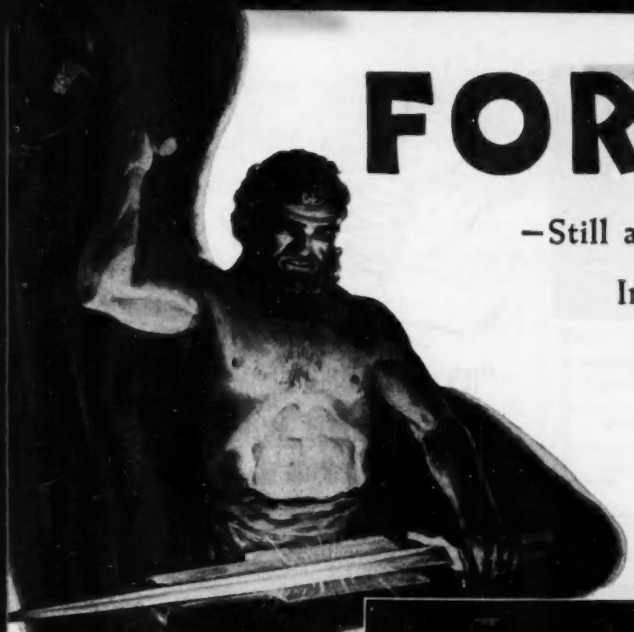
ELCO TOOL AND SCREW CORPORATION
1914 BROADWAY · ROCKFORD, ILL.



FORGING

—Still a Most Important Factor in the Arms Program

In bygone days, when mankind's first important use of forging was in the manufacture of the sword. From the short Roman sword of the Imperial legions through the broadswords of the Arthurian knights to the Damascus blades of the Crusaders and the rapiers of the Three Musketeers, the smith who forged the blades was the key man back of the fighting line.

As wars become more and more mechanized so has the need for forgings in vital parts of war mechanisms increased, until in today's complicated and almost completely mechanized warfare, superiority depends to a great extent on the forgings that make up the mechanical equipment on land, sea and air.

The reason is obvious: Forgings have superior advantages over all other forms of metal fabrication. The metal is given higher tensile strength and toughness through controlled concentration of grain structure and fiber-like flow lines. Forging's greatest advantage, especially in equipment for war, is in the ability to meet unpredictable shocks, stresses and strains.

Today the hammers of the country's forge shops are working as never before to meet the demands that war preparation has thrown on them—and much of this work is being done on Chambersburg hammers.

CHAMBERSBURG ENGINEERING CO. • CHAMBERSBURG. PENNA.

CHAMBERSBURG

THE HAMMER BUILDERS

PHOSPHATE COATING CHEMICALS FOR SPECIFICATION FINISHES

METAL	GOVERNMENT SPECIFICATION	ACP SPECIFICATION CHEMICAL
STEEL	JAN-C-490, Grade I U.S.A. 57-0-2, Type II, Class C U.S.A. 51-70-1, Finish 22.02, Class C	"GRANODINE"
	U.S.A. 57-0-2, Type II, Class B U.S.A. 51-70-1, Finish 22.02, Class B	"PERMADINE"
	U.S.A. 57-0-2, Type II, Class A U.S.A. 51-70-1, Finish 22.02, Class A	"THERMOIL-GRANODINE"
ALUMINUM	MIL-C-5541 MIL-S-5002 AN-F-20 U.S. Noword O.S. 675 16E4 (Ships)	"ALODINE"
ZINC	QQ-P-416 RR-C-82 JAN-F-495 AN-F-20 U.S.N. Appendix 6	"LITHOFORM"

"GRANODINE"®

"GRANODINE" forms a zinc phosphate coating on steel and zinc surfaces. This non-metallic bond holds and protects the paint finish and thus preserves the metal underneath.

"PERMADINE"®

"PERMADINE" forms an oil-adsorptive zinc phosphate coating on steel, which, when treated with rust inhibiting oil, is highly corrosion resistant.

"THERMOIL-GRANODINE"®

"THERMOIL-GRANODINE" forms a manganese-iron phosphate coating on steel, which, when oiled, provides wear-resistance for rubbing parts — and, when oiled or painted, inhibits corrosion.

"ALODINE"®

"ALODINE", the new ACP protective coating chemical for aluminum, anchors the paint finish and protects the metal painted or unpainted.

"LITHOFORM"®

"LITHOFORM" makes paint stick to galvanized iron and other zinc and cadmium surfaces.

Write for more information on these products. Send for new descriptive folders on the ACP metal-protective, rust proofing and paint bonding chemicals listed in this advertisement.

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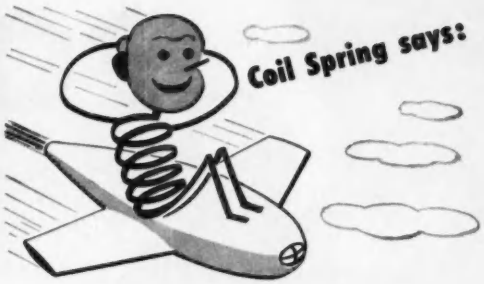
AMERICAN CHEMICAL PAINT COMPANY

AMBLER, PA.

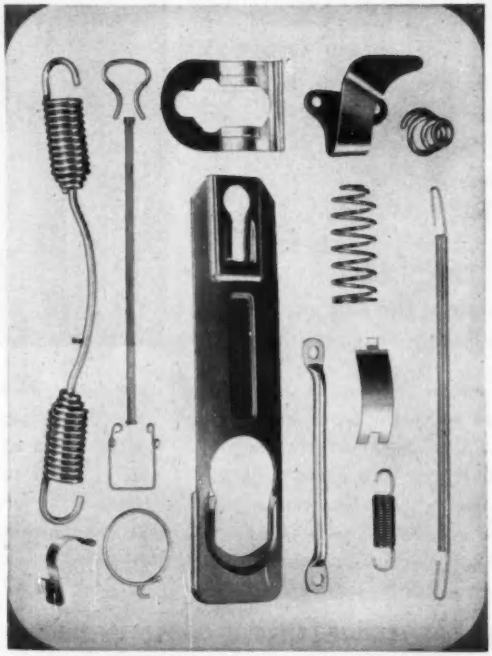
Manufacturers of METALLURGICAL, AGRICULTURAL and PHARMACEUTICAL CHEMICALS



"It's All Smooth Sailing When You Use U. S. STEEL WIRE SPRINGS"

The first step toward solving your spring problems is to turn to us for help. We take it from there. Skilled workmanship, combined with modern production facilities, results in our ability to produce springs and small parts in any quantity to suit your needs. Call or write today.

Producing Clutch Pressure Springs
. . . Clutch Dampener Plate Springs



The U. S. STEEL WIRE SPRING Co.

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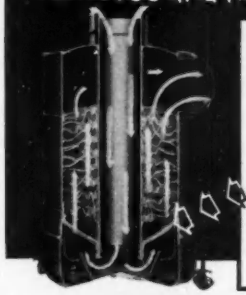

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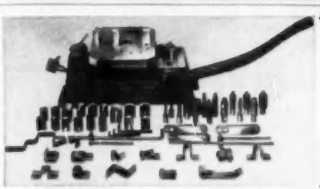

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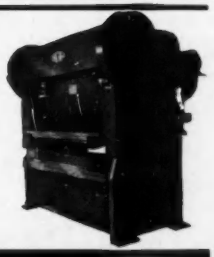

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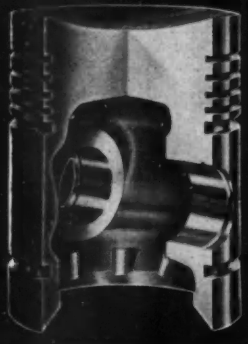

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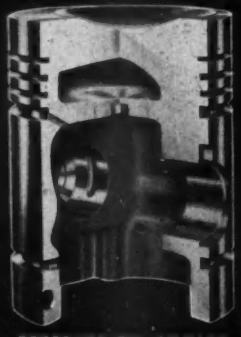

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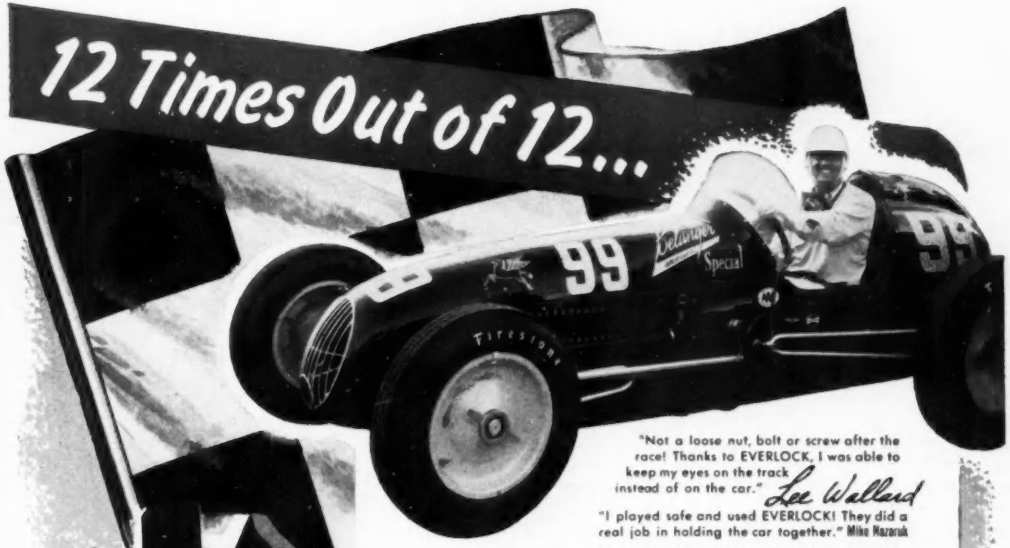

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***In Detroit:* Sam T. Keller Company, 2457 Woodward Ave.**

Everlock

PROTECTED CARS FINISH 1-2-3 AT INDIANAPOLIS 500-MILE CLASSIC IN 1951

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The Washer That Has The Edge

How to make the one sale that isn't duck soup

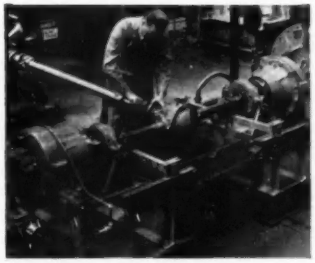
EVEN in the middle of a seller's market there's still one real selling job that needs to be done. That's the job of *keeping* a customer sold on the car he has bought —a job that grows in importance the longer the nation's cars must be kept in service.

And that's where value, vital in making the sale in the first place, comes in again. Especially value in the "vital zone", where value counts most. How to be sure of getting value in the "vital zone" parts you buy? This formula may be helpful:

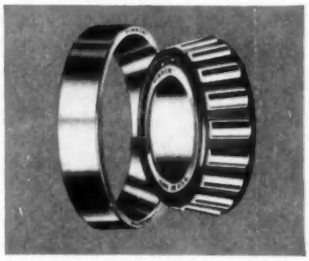
$$Value = \frac{quality + service + public\ acceptance}{price}$$

It shows that price is only *one* factor in value, and must be weighed in relation to the factors *above* the line. Timken® bearings give you far more above the line than any other tapered roller bearings, as shown in the chart at lower right. And in terms of value features, Timken bearing prices are lowest today. So by this formula or any other, your best value in tapered roller bearings is Timken bearings. The Timken Roller Bearing Company, Canton 6, Ohio.

How TIMKEN® bearings give you value where it counts most . . . in the "vital zone":



EXTRA SERVICE. The Timken Company constantly carries on research to help auto makers get better service from bearings and related parts. For example, by using test machines like the dynamometer, we test transmissions and axles for fatigue, oil flow, temperature and efficiency.



PINION-PROVED. On the pinion—toughest bearing application in the car—Timken bearings are standard on all but two makes of cars. Throughout the "vital zone"—in pinions, wheels, differential, transmissions, steering gears—Timken bearings give top value.

ONLY TIMKEN BEARINGS GIVE YOU ALL THESE VALUE FEATURES

QUALITY

1. Design leadership
2. Steel made in our own mill
3. Precision manufacture
4. Rigid quality control
5. 50 years experience

SERVICE

6. Unequalled engineering service
7. Unequalled research and development facilities for your use
8. Installation service in the field
9. Widest range of sizes
10. Most dependable source of supply

PUBLIC ACCEPTANCE

11. First choice throughout industry
12. Best-known name in bearings
13. Widespread advertising

it's TIMKEN for VALUE

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◯ AND THRUST →◯← LOADS OR ANY COMBINATION →✳←